Secondary School Teachers' Utilization of Feedback in the Teaching and Learning of Mathematics in Tanzania

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Abstract
This study presents the findings of a study conducted to explore secondary school mathematics teachers' understanding and utilization of feedback in the teaching and learning of mathematics in Tanzania. The study was anchored on the premise that effective feedback is a prerequisite for the successful teaching and learning of Mathematics. Feedback given in line with formative assessment helps learners to be aware of any gaps that exist between their desired learning goal and their current knowledge, skills and understanding of the subject matter. The major concern of assessment practices in Tanzania is the fact that feedback as an aspect of formative assessment is not given enough attention in the teaching and learning of mathematics. The study employed a mixed-methods research approach and consisted of 36 respondents drawn from twelve private and public secondary schools in Arusha City and Kinondoni Municipality. The data were collected through interviews, classroom observation and documentary analysis. Quantitative data from classroom observation were analysed statistically using the Mann-Whitney U test and Kruskal-Wallis H test. Qualitative data from interviews were analysed using thematic analysis. The findings showed that mathematics teachers knew little about the utilisation of feedback in teaching and learning mathematics. In particular, the findings indicated that utilisation of feedback in the classroom was influenced by teachers' demographic characteristics, such as gender, school type and teaching experience, while characteristics such as teachers' qualifications, number of periods and class size had no influence on teachers' provision of feedback. The findings further revealed that teachers' lack of awareness of feedback influenced its effective utilisation in mathematics classes. This study recommends provision of in-service training focusing on formative assessment of mathematics teachers.

Key words: Feedback, formative assessment, classroom assessment, teaching and learning mathematics.

Introduction

Feedback is an important part of teaching and learning when it is effectively utilised by teachers and students in the classroom. Black and William (1998) noted that when students receive written feedback and are given the opportunity to reflect on it, they gain from it. Feedback should be given regularly, and it should be specific and encouraging because feedback as part of formative assessment helps learners become aware of any gaps that exist between their desired goal and their current knowledge, understanding or skills, and it guides them to take the action necessary to obtain the goal (Saldler, 1989). It is reported that feedback plays a

substantial role in supporting students' learning when incorporated with suggestions for improvement (Kitta & Tilya, 2010). This study therefore reports on the findings on mathematics teachers' understanding and utilisation of feedback in line with formative assessment in teaching and learning.

An Overview of the Types of Assessment in Teaching and Learning

Students' assessments are normally put into four major categories (William & Thompson, 2008). The first is *placement assessment*, which is administered before students begin a lesson, unit, course or academic programme. Students are not necessarily expected to know most, or even any, of the material evaluated by placement assessments, but are generally used to establish a baseline against which educators' measure learning progress over the duration of a programme, course or instructional period. The goal of placement assessment is to determine each student's position in the instructional sequence and the mode of instruction that is most beneficial. Second, *diagnostic assessment* is used to identify what the learning problem is, but stops short of identifying how the learner could improve his or her work. Third, *formative assessment* does not occur until the preceding two steps have taken place and the learner is given feedback to help him/her determine what to do in order to improve learning (William & Thompson, 2008). Fourth, *summative assessment* refers to the assessment given at the end of a learning period to determine if learning occurred, and often to place some value (score) on how much learning had occurred or to quantify how much a learner knows about the subject matter. Learning may be a secondary benefit as a result of doing a summative assessment, but the primary purpose is to *measure* learning and to make informed inferences about the learner's ability or level of achievement (Atkin, Black, & Coffey, 2001).

The Concept of Formative Assessment in Teaching and Learning

Formative assessment is an assessment the first priority of which is to design it to serve the purpose of promoting students' learning (Black, Harrison, Lee, Marshall, &William, 2004). It is a process in which teachers use various tools and strategies to determine what students know, identify gaps in their understanding, and plan future instruction to improve learning (Heritage, 2007). On the other hand, Qualters (2000) defines formative assessment as activities that are used to improve student learning, which may be graded or ungraded, but provide learners with information that allows them to learn something about their knowledge or skills, make a change, and ultimately improve their learning. Popham (2008) presented a more succinct definition and asserted that formative assessment is a planned process in which assessment-elicited evidence of students' status is used by teachers to adjust their ongoing instructional procedures or by students to adjust their current learning tactics. There are three types of formative assessment, which are long-cycle, medium-cycle and short-cycle. These are conducted unobtrusively as a natural part of the instructional activity, with "short-cycle," occurring during a lesson or unit of study and providing immediate feedback to the teacher. Table 1 presents the types of formative assessment in relation to their focus, duration and impact.

Table 1: ***Types of formative assessment***

Types	Focus	Duration	Impact

Long-cycle	Across units, terms, semesters or years	4 weeks to 1year	Student monitoring; curriculum alignment.
Medium-cycle	Within and between instructional units	1 to 4 weeks	Improved student- involved, assessment; teacher cognition about learning.
Short-cycle	Within and between lesson	Day by day; 24 to 48 hours, Minute by minute; 5 seconds to 2hours	Classroom practice; student engagement.

Source: William and Thompson (2008)

William (2011) observed that formative assessment can take many forms including, but not limited to, class assessments, benchmark and interim assessments, teacher questioning, response cards, and exit passes. On the other hand, Shepard (2005) contends that what makes formative assessment formative is its immediate application to make adjustments so as to form a new basis for learning. Formative assessment is a way of helping students to identify where they are at a particular moment in the learning process, and how they can get to where they want to go (Black, Harrison, Lee, Marshall & William 2003).Furthermore, formative assessment is any assessment in which the priority in its design and practice is to serve the purpose of promoting pupils' learning. It thus differs from assessment designed primarily to serve the purposes of accountability or ranking, or to certify a certain competence.

Klenowski (2009) noted that the terms "assessment of learning" and "formative assessment" are often used interchangeably in different educational contexts. Black et al. (2003) argue that the significance of assessment of learning is to promote (rather than to evaluate) students' learning, and that formative assessment operates to provide information for teachers to use in giving feedback, and to assist teachers in adapting and modifying both their teaching and students' learning. 0756 240 111

Feedback aspect of Formative Assessment

Research evidence shows that feedback is a key aspect of formative assessment in the teaching and learning process, and when it is effectively implemented in the classroom substantial learning gains are achieved (Black & William, 1998b). A study by Ndalichako (2015) established that it is the obligation of teachers in the classroom to provide feedback on students' progress over a period of time so that any errors or learning difficulties can be identified and corrected. To achieve this, feedback should reflect learning expectations and focus on individuals' particular needs and peer-assessment. In essence, feedback regulates teaching and adjusts teachers' teaching arrangements. Thus it encourages the active participation of students in learning. Students participate actively and productively in the teaching and learning process if their teachers' communicate the lesson goals and the criteria to be used to judge their progress (Bennett, 2011; Harlen, 2007).

Thompson and William (2007) noted that the provision of feedback that improves learners' learning entails teachers focusing on monitoring students' learning. Lee (2008) states that feedback should be provided to students and used by the teacher to improve the quality of instruction. Thompson and William (2007) further contend that one example of a formative assessment technique that supports this strategy is comment-only marking that provides non-graded feedback on assignments. In the same vein, Bangert-Drowns, Kulick, and Morgan (1991) noted earlier that the most helpful type of feedback on tests and homework is the provision of specific comments on errors and specific suggestions for improving and encouraging students to focus their attention on specific features of their work rather than on

simply getting the right answer. This suggests that teachers should use feedback constantly to assess their students' learning and behaviour and use the results of assessment to improve performance (Airasian & Russell, 2008; Brooks, 2002). Therefore, teachers' feedback should provide opportunities during class discussion for students to reflect review and revise their assessed work.

It is argued that when feedback is given in line with formative assessment it helps learners become aware of any gaps that exist between their desired learning goals and their current knowledge, understanding or skill (Sadler, 1989). Similarly, it guides and provides the way through which the actions needed to obtain such goals can be taken (Boston, 2002; Harlen& James, 1997). The view that feedback is an important part of formative assessment concurs with two conditions for effective feedback (Ramaprasad, 1983; Sadler, 1989). First, feedback must identify any gaps between the desired learning goal and the student's present status in terms of achieving that goal. Second, feedback must enable students to take action to close that gap in their learning and understanding.

Lee (2008) outlines the following procedures for effective feedback in the classroom.1) learners should be told about their strengths and weaknesses and what needs to be done; 2) information should be communicated clearly to learners about what they have learnt; 3) feedback should clarify good performance and promote a close link between teaching, learning and assessment; 4) feedback should provide learners with opportunities to act on the teacher's feedback and to improve their work; 5) feedback is effective if it encourages learners to play an active role in managing their learning; and 6) feedback is effective if it is used to improve teaching. Lee (2008) added that feedback becomes a more relevant and useful component of formative assessment when it is done during instruction or immediately after teaching. In the same study, however, Lee revealed that teacher' feedback reports only on learners' errors instead of providing suggestions for improving their performance through tackling their weaknesses. According to Adendorff (2007), feedback does not simply happen intuitively but teachers have to learn how to give and receive feedback effectively using specific techniques. The foregoing review on feedback suggests that, both conceptually and in practice, it enhances assessment which, in turn, improves teaching and learning depending on the existing context.

Teachers' Demographic Characteristics that Influence utilisation of Feedback

Teachers' demographic attributes such as gender, educational qualifications and teaching experience, as well as class size, had impact on the utilisation of feedback in teaching and learning (Rivkin, Hanusheck & Kain, 2005). In their study, Akiri and Ugborugbo (2008) found that there was a statistically significant relationship between teachers' gender and the provision of classroom assessment. Ndalichako (2015) noted that in terms of classroom practices, the finding suggests that female teachers tend to use assessment more often to facilitate and support teaching and learning than their male counterparts. In the same vein, Islahi (2013) observed that female teachers are more supportive, expressive and nurturing, and spend a significantly greater proportion of their time encouraging students to participate in teaching and learning. Islahi (2013) added that male teachers asked more display questions that limited communication between teacher and students, and they used an authoritarian and task-oriented teaching style which did not involve students. Similarly, the previous study confirmed that female teachers were more supportive than male teachers in the classroom, they provided students with effective feedback and allowed and encouraged them to interact (Good & Brophy, 1973; Statham, Richardson & Cook, 1991; Wood, 2012). They also allowed their teaching to be flexible and strengthened their relationship with students by asking more inferential questions than male teachers.

On the other hand, Afe (2001) noted that in terms of qualifications and experience teachers play an important role in students' educational attainment because they are responsible for implementing the school curriculum. Adeyemi (2010) asserted that teachers' experience and educational qualifications were the main predictors of students' academic achievement. Similarly, Ong'ele (2007) confirmed that teachers with more teaching experience performed better in the classroom than those with less teaching experience. Iheanacho (2002) argued that teachers with higher education qualifications and longer working experience are more effective than those with lower qualifications. The study conducted by Waseka, Simatwa and TO (2016) reveal that the most important factor affecting the quality of education is the quality of the individual teacher in the classroom. There is evidence that a teacher's ability and effectiveness are the most influential determinants of students' academic achievement.

Biddle and Berliner (2002) noted that reducing the size of the class will enhance students' academic achievement and give teachers and students more opportunities to interact through the provision of effective feedback. The study by Blatchford (2003) found that reducing class size enhanced students' learning through teachers spending more time with them and giving them individual support, which meant that they needed to manage the class well. When we think of reducing class size and assessment as resources for schooling, it is clear that smaller classes can promote the utilisation of formative assessment (Graue, Hatch, Rao & Oen, 2007).

Theoretical Framework

Theoretically this study is informed by the Social Constructivism Theory of teaching and learning which supports the socio-cultural theory of learning. This theory was deemed relevant to explain how feedback, an aspect of formative assessment, takes place in the classroom (Crossouard, 2009; Gipps, 1994; James, 2006; Mkhwanazi, 2014). From the socio-cultural constructivist perspective, learners are seen as actively constructing their own knowledge and understanding through cognitive processes within the social and cultural context (Greenfield, 2009; Vygotsky, B V1978 ;). Socio-cultural theorists call for the adoption of formative assessment whose primary goal is to help students take the next step in learning rather than to judge them at the end of learning and its outcome to determine their achievement (Shepard, 2000). In the classroom learners should be cognitively active and stimulated in order for learning to take place. According to Vygotsky (1978), learners are the constructors of their own knowledge and skills and they should engage their thinking skills to construct knowledge for themselves. Constructivists regard feedback in the process of teaching and learning as vital for meaningful learning to take place (James, 2006). In this case, formative assessment aids learning by generating feedback that is of benefit to students and teachers. Feedback on performance, in class or on assignments, enables students to restructure their understanding/skills, develop more powerful ideas and improve their ability. Furthermore, McMillan (2008) asserted that in a socio-cultural classroom teachers should be able to use assessment results to provide effective feedback and make decisions about students' educational achievement and on what needs to be improved.

In addition, this study adopts Thompson and William's (2007) framework, which puts more emphasis on feedback as an aspect of formative assessment through asking three important questions: *Where is the learner going? Where is the learner right now? How can the learner get there?* This implies that in the classroom, students receive feedback from their teacher and peers, which they reflect on, and in so doing they are able to focus on the learning goals they intend to attain. The teacher is encouraged to provide feedback to students about their performance, as it moves learning forward (Black, 1998). The two theories have been

instrumental in this study whereby for the teacher to close the learning gaps of students effective feedback is necessary.

Purpose of the Study

The purpose of this study was to investigate secondary school teachers' understanding and utilisation of feedback in line with formative assessment in the teaching and learning of mathematics. Specifically, the objectives of the study were twofold:-

1. To explore mathematics teachers' knowledge of the feedback aspect of formative assessment in teaching and learning mathematics.
2. To assess teachers' utilisation of effective classroom feedback in line with formative assessment to improve the teaching and learning of mathematics.

Research Methodology

This study employed the mixed methods research approach (Creswell, 2009; Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 2003) to collect data from six private and six public secondary schools in Arusha city and Kinondoni municipality. This approach was used mainly for triangulation purposes where both qualitative and quantitative methods were concurrently used to collect, analyse and interpret the data. The sample consists of 36 mathematics teachers, 18 from Kinondoni municipality and 18 from Arusha city. The study employed the stratified sampling procedure to obtain the teachers who were observed in the classroom and interviewed. Stratified sampling was also used to obtain representative categories of teachers in terms of gender, teaching experience and educational qualifications. This was considered important for analysing the influence of teachers on the utilisation of the feedback aspect of formative assessment in teaching and learning mathematics. Table 2 presents the demographic characteristic of the participants.

Table 2: ***Demographic Characteristics of Mathematics Teachers***

	Gender		**Qualifications**			**Teaching Experience**		
	M	F	Dip	Bachelor	Master	1-5years	6-10years	11+
Arusha city	12	6	5	12	1	9	3	6
Kinondoni	13	5	6	9	3	6	4	8

Keys: M= Male, F= Female, Dip= Diploma

The study employed three methods of data collection. Classroom observation, adapted from Oswalt (2013), which consisted of a 5-point Likert scale, was used to assess utilisation of the feedback aspect of formative assessment. Observation focused on the following items: meaningful feedback, accurate feedback that assists learning, feedback in relation to criterion-based standard, feedback identifying specific area for improvement, and feedback that describes students' strengths and weaknesses. In addition, the study conducted face-to-face interviews with mathematics teachers to explore their knowledge and skills on the feedback aspect of formative assessment. Furthermore, documentary sources such as students' exercise books and marked papers were employed to triangulate the data collected through observation and the interviews. Documentary analysis was used to examine the nature and quality of feedback as revealed in students' exercise books and their completed marked assignments.

Inferential data analysis was used to analyse the quantitative data using the Mann-Whitney U test and Kruskal-Wallis H test. The qualitative data from interviews were analysed using

thematic analysis techniques, whereby they were summarised and coded following the themes emerging from the research objectives.

Findings of the study

The research objectives and theoretical framework were used as an organising tool to present the findings.

Teachers' conception of feedback in teaching and learning mathematics

Data collected from mathematics teachers about their conception of feedback revealed two perspectives, which are; feedback as an ongoing process and feedback as a response to students' assignments or examinations.

Feedback as an ongoing process

The findings indicated that 12 out of 36 teachers (33.3%) who were interviewed considered that feedback was an ongoing part of the teaching and learning process. This view was supported by one teacher from a private school in Kinondoni Municipality. The teacher was quoted as saying:

> The feedback is an ongoing process which takes place throughout teaching and learning in class. The feedback should be given immediately after teaching a certain concept or after the lesson. If you wait for a long time it is useless. Feedback should be given to identify students' learning difficulties. If you don't provide feedback it will be difficult to identify their weaknesses. Feedback helps to correct mistakes and encourages good performance.

The above quotation suggests the following. First, it is imperative to provide feedback immediately in order to identify students' learning difficulties and correct them accordingly. Secondly, when feedback is used effectively it motivates students to improve their performance. Thus, teachers should consider feedback an important aspect of teaching and learning.

Feedback as a response to students' assignments or examinations

On the other hand, 24(66.6%) teachers conceived that feedback occurs when teachers share with students their assignment, test or examination results. In this regard, one teacher from a school in Arusha City had this to say:

> …first of all we have the school policy which requires teachers to provide tests and give feedback immediately. In the case of terminal and annual examinations, we should provide feedback within seven days. The other way is to make comments on what they have done and show appreciation

From this quotation it can be deduced that teachers' knowledge about feedback is limited to examinations, tests and quizzes. The teacher reported that school requirements on assessment demand them to provide feedback immediately after providing assignments to students. The teacher also stated that feedback is given in terms of comments when students perform certain activities. These views were echoed by a teacher from a public school in Arusha city who maintained that:

> I give feedback especially after teaching the lesson. I provide an assignment and then after marking it I give my students feedback. However, this may take a few days depending on the size of the class

The above findings indicated that teachers' knowledge and understanding of feedback is limited to sharing with students their test or examination results. This implies that feedback comes at the end of the teaching and learning process.

The second objective of the study focused on teachers' utilisation of feedback to improve the teaching and learning of mathematics. The findings on this were analysed based on gender, training status, teaching experience, teachers' qualifications, number of periods and class size. Table 3 presents the results of the Mann-Whitney U test based on gender difference and training status.

Table 3: ***Mann-Whitney U test on utilisation of feedback based on teachers' gender, school type and In-service training status***

	Measure				**Mann-Whitney U test**	
		N	**Mean Rank**	**Sum of Ranks**		**Sig.**
Gender	Male	25	16.22	405.50	80.50	0.049
	Female	11	23.68	260.50		
School type	Public	18	23.75	427.50	67.50	0.003
	Private	18	13.25	238.50		
Training status	Trained	22	20.11	442.50	118.50	0.25
	Untrained	14	15.96	223.50		

Table 3 reveals that female teachers obtained a mean rank of 23.68 and male teachers obtained a mean rank of 16.22, with p-value =0.049 which were statistically significant at $\alpha = 0.05$ level of confidence. This implies that female teachers appear to be more skilled in giving students feedback than their male counterparts. In terms of school types, the findings revealed that public school teachers obtained a mean rank of 23.75 and private school teachers obtained a mean rank of 13.2 with p-value = 0.003 which were statistically significant at $\alpha = 0.05$ level of confidence. This suggests that teachers in public schools appear to be more skilled in utilising feedback in teaching and learning mathematics than teachers in private schools.

With respect to in-service training, the findings revealed that trained teachers obtained a mean rank of 20.11 and untrained teachers obtained a mean rank of 15.96with p-value = 0.2 which were not statistically significant at $\alpha = 0.05$ level of confidence. This implies that the in-service training received by mathematics teachers might not have provided them with the necessary knowledge and skills for utilising feedback in the teaching and learning of mathematics.

Further analysis was performed using the Kruskal-Wallis H test, based on teachers' qualifications, teaching experience, number of periods and class size. Table 4 presents the findings for each criterion.

Table 4: ***Kruskal-Wallis H test on utilisation of feedback based on selected teachers' demographic attributes***

	Measure	**N**	**Mean Rank**	**χ^2-square**	**df**	**Sig.**
Qualifications	Diploma	11	20.41	0.776	2	0.678
	Bachelor	21	18.12			
	Master	4	15.25			
	1-5years	15	14.50			

Teaching experience	6-10years	7	15.43	7.093	2	0.029
	11+ years	14	24.32			
Number of Periods	Less than 20	13	16.31	3.864	2	0.145
	Between 20 and 30	9	24.44			
	30+	14	16.71			
Class Size	Below 40	3	14.83	1.569	2	0.456
	Between 40 and 50	13	16.38			
	50+	20	20.43			

Table 4 reveals that, in terms of teachers' qualifications, diploma holders appear to utilise feedback more effectively than teachers with a bachelor's or master's degree(with a mean rank of 20.41, 18.12 and 15.25, respectively) with $\chi^2 = 0.776$ and p-value 0.678 which were not statistically significant at $\alpha = 0.05$ level of confidence. This finding suggests that academic qualifications did not influence teachers' utilisation of feedback in teaching and learning mathematics. With regard to teaching experience, the findings indicated that teachers with more than 11 years obtained a mean rank of 24.32 with $\chi^2 = 7.093$ and p-value 0.029 which were statistically significant at $\alpha = 0.05$ level of confidence. This could mean that teachers with a lot of teaching experience were skilled in providing effective feedback to students during teaching and learning. Therefore, these findings suggest that teaching experience is one of the factors that influence utilisation of feedback in teaching and learning mathematics in secondary schools.

In terms of teachers' number of periods per week, the findings revealed that teachers with a number of periods between 20 and 30 obtained a mean rank of 24.44 while the other two groups of teachers obtained an almost equal mean rank. This could mean that teachers with a moderate teaching load utilised feedback better than their counterparts, although it is not statistically significant at $\alpha = 0.05$ level of confidence.

On class size, the findings indicated that classes with more than 50 students obtained the highest mean rank of 20.43, while classes with an average number of students obtained a mean rank of 16.38 or less, with the noted $\chi^2 = 1.569$ and p-value = 0.456 which were not statistically significant at $\alpha = 0.05$ level of confidence. The findings imply that teachers were more effective in overcrowded classes than less crowded ones. Therefore the findings suggest that class size did not influence teachers' utilisation of feedback.
Furthermore, documents were reviewed to analyse and identify the nature of feedback provided by mathematics teachers in students' exercise books and the findings are presented in Table 5.

Table 5:*Teachers' Feedback in Students' Exercise books and Assignments*

Types of document	Feedback provided by Teacher
Students' exercise books	Marked with tick, marked with cross, good, score, fair, excellent and see me.
Students' marked tests/assignments	Marked with tick, marked with cross, good, very good, excellent and numerical scores

Table 5 reveals that the nature of teachers' feedback was almost consistent in the students' textbooks and assignment sheets. Teachers marked only classroom quizzes, exercises, homework and tests. The most frequently used form of feedback was *ticks* for the correct answers and *cross* for the wrong answers (cf. figure1).

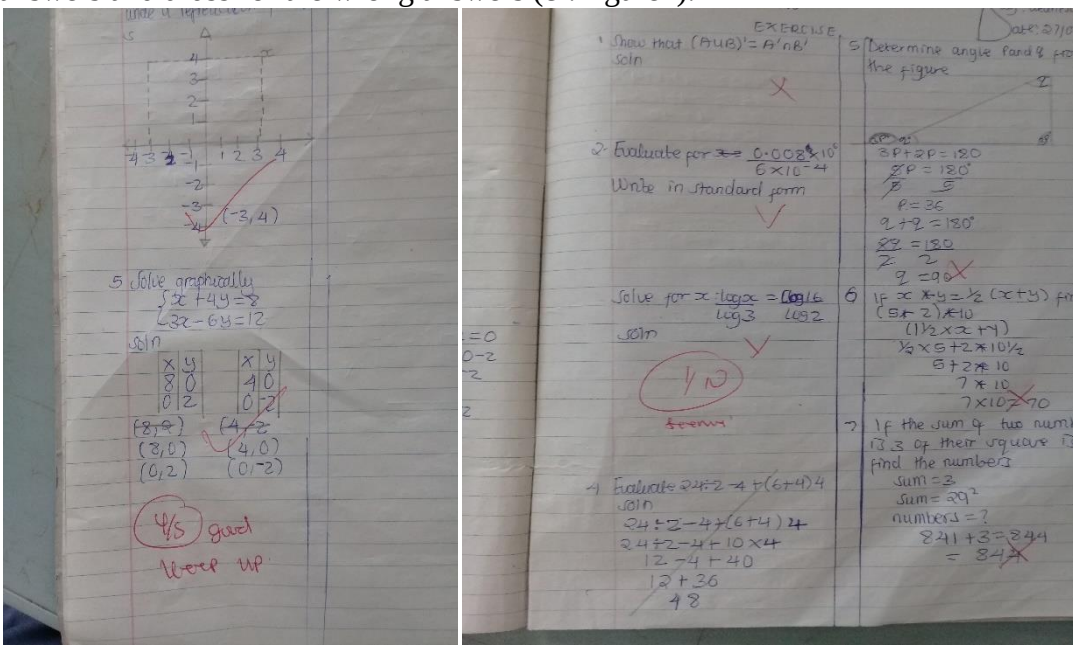

Figure 1: Teachers' feedback on Students' worksheets

Figure 1 presents the type of the feedback in students' exercise books and worksheets. The most dominant form of feedback were comments like *excellent, good, very good, keep it up, fair and good try* for students who performed well. On the other hand, comments given for students who performed poorly were *see me, work hard, lazy and poor*. This suggests that mathematics teachers lacked the necessary skills for providing constructive feedback to students to improve their learning.

Discussion of the findings

The findings of this study revealed that teachers utilised feedback in teaching and learning mathematics regardless of their limited knowledge and understanding of feedback as an aspect of formative assessment. The findings revealed that female teachers were better than male teachers at giving feedback. This finding concurs with other studies (Good & Brophy, 1973; Statham, Richardson &Cook, 1991; Wood, 2012) which reported that female teachers were more supportive than male teachers in the classroom by providing effective feedback to students as well as encouraging and allowing then to interact. They were also more flexible in their teaching and fostering their relationship with students by asking more inferential questions than male teachers. Regarding school type, the findings revealed that teachers from public schools utilised feedback more effectively than their counterparts from private schools. This implies that teachers in private schools lacked the necessary skills and knowledge for providing feedback to students due to various factors, such as pressure to cover the syllabus, teaching more than one subject and the frequency of examinations and tests. In private schools, the owners asked and expected learners to focus on examinations and tests than actual teaching. This view on examinations is shared by Ndalichako (2015), who reported that the majority (94.4%) of teachers held the strongly view that frequent assessments make students concentrate their efforts on learning.

With regard to teachers' teaching experience, the findings indicated that experienced teachers were better at providing feedback than less experienced teachers. Experienced teachers have confidence in the classroom and are flexible in utilising various assessment techniques as well as possessing pedagogical content knowledge skills. The finding confirmed those of a previous study by Bandu and Kagete (2014), who reported that teachers with a lot of experience were better at doing assessments than those with less experience.

Moreover, it was interesting to note that teachers with a large number of periods per week were better at utilising feedback than teachers with fewer periods. The reason for this could be associated with the allocation of periods in Tanzania, where competent teachers are given a heavier teaching load. Furthermore, the findings indicated that class size did not influence teachers' utilisation of feedback in teaching and learning mathematics (no evidence).

The nature of feedback provided by mathematics teachers on students' worksheets and exercise books indicates that teachers have limited knowledge about the feedback aspect of formative assessment. The most common feedback used was a *tick* for the correct answer and a *cross* for the wrong answer, with short phrases such as *excellent, good, keep it up, see me, work hard, lazy and poor*. These comments do not provide students with constructive feedback which would help them to improve their work. This view was in line with the study by Malaba (2013) who noted that teachers' comments constitute shallow feedback, which is not helpful to students who either perform poorly or perform well.

Conclusion and recommendations

Based on the study findings it is concluded that mathematics teachers had limited knowledge on the feedback aspect of formative assessment in teaching and learning mathematics. The majority of teachers' knowledge about feedback was revealed in what they wrote on students' assignment or examination sheets. Despite their limited knowledge on feedback, teachers utilised it in the teaching and learning of mathematics in their classes, which was influenced by teachers' demographic characteristics such as gender, school type and teaching experience

The study therefore calls for in-service training to be given to mathematics teachers that focuses on formative assessment, which will enable teachers to utilise feedback to improve the teaching and learning of mathematics in secondary schools.

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