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Classroom Implementation of Peer and Self-Assessment for Effective Teaching and Learning Mathematics in Secondary Schools in Tanzania

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***Abstract*: The study investigated the implementation of self-assessment and peer assessment in learning and teaching mathematics in secondary schools in Tanzania. The mixed methods study approach was used where twelve schools in Arusha and Kinondoni Municipals participated in the study. The participants were teachers teaching mathematics in secondary schools. Both public and private schools were involved. Data were collected using questionnaires and classroom observation schedule. Quantitative data from classroom observation were analysed statistically using the Mann-Whitney U test and Kruskal-Wallis H test. The study found that teacher's demographic characteristics such as gender, teaching experiences, employer type, and professional qualifications affect partially the effective utilization of peer and self-assessment in mathematics classes. It was also revealed that while workload affects partially the implementation of self-and peer assessment practices, class size significantly affects utilization of peer assessment among mathematics students in secondary schools in Tanzania. The study recommends training for mathematics teachers focused on the utilization of aspects of formative assessment.**

***Keywords*: self-assessment, peer assessment, formative assessment, classroom assessment, teaching and learning mathematics.**

1. Introduction

Self-assessment and peer-assessment are important aspects of formative assessment or assessment for learning (AfL) practice. Assessing their own work or the work of others can aid learners in understanding learning objectives and criteria for success. The ability for the learner to assess their own work or that of others can help them to develop their understanding of learning objectives and criteria for success. Research has shown that pupils make more progress when they are actively involved in their own learning and assessment (NFER 2013). In the classroom, peer and self-assessment are effective strategies for improving students' learning when using assessment as a learning tool. Explicitly teaching students how to assess their own work, and the work of their peers has many benefits. Edwards (2014) notes that peer assessment has many benefits as it allows learners to learn by being scaffolded by the more knowledgeable others. It promotes student understanding of their learning and provides opportunities for critically analyzing their efforts, encouraging them to become more autonomous learners. Students engage in peer assessment by evaluating their peers' work compared to the success criteria for a particular learning objective and then offering constructive feedback. Self-assessment is defined by Andrade (2019) as a personal unguided reflection on one's performance for the purpose of obtaining individuals summary of their level of understanding, knowledge and skills in a particular learning area. Students engage in applying success criteria associated with a learning objective, reflecting on their efforts, identifying areas for improvement, and making necessary adjustments to enhance the quality of their work. Both meaningful peer assessment and self-assessment by students have the potential to make a positive impact on student learning and academic performance.

A. Strategies of Formative Assessment

There are five strategies of formative assessment namely, sharing learning intention, classroom monitoring, feedback, self-assessment and peer assessment (Wiliam (2005). The self-assessment strategy refers to activating students as the owners of their learning which focuses on developing students' self-regulatory abilities (Oswalt, 2013). Andrade and Du (2007) offer a useful definition of self-assessment within the framework of formative assessment. They describe it as a process where students reflect on a given task, evaluate the quality of their work, determine how well it meets explicitly stated goals or criteria, identify strengths and weaknesses, and make revisions as necessary. Boud (1995) describes self-assessment as involving two key components: deciding on the expected performance standards and evaluating the quality of the performance against those standards.

Brew (1995) noted that the self-assessment process equips students not only to solve known problems but also to tackle problems that are currently beyond our conception. In addition, Spiller (2012) identifies purposes and importance of encouraging student self-assessment as it cultivates self-learning and life-long learning, promotes student's career choices, encourages reflections, self-learning, self-responsibilities, and a sense of ownership learning.

The self-assessment strategy aims to "promote self-regulated

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Table 1
Key strategies of formative assessment

	Where the learner is going	Where the learner is now	How to get there
Teacher	Clarifying, sharing and understanding learning intentions and success criteria	Engineering effective discussions, tasks and activities that elicit evidence of learning	Providing feedback that moves learning forward
Peer		Activating students as learning resources for one another	
Learner (Self)		Activating students as owners of their own learning	

Source: Thompson and Wiliam (2007)

learning (SRL), an academically effective learning approach characterized by metacognition, intrinsic motivation, and strategic action" (Clark, 2012, p. 206). Self-regulated learning allows learners to attain their desired goals by generating multiple ideas and thoughts, to handle a given problem (Perumanathan, 2014). In the same regard, Chappuis and Chappuis (2008) assert that it is common for advocates of self-assessment strategy to ask students to promote their self-regulatory abilities by answering questions that focus on students' ability to solve problems, addressing own weaknesses, notice improvement, ways to improve the available solution suggesting ways for improvement.

Spiller (2012) observes that self-assessment can be implemented by classroom teachers by encouraging students to reflect on themselves before introducing any "self-assessment" tasks. Boud (1995) highlights the following four key aspects that should be considered in implementing the self-assessment process:

i. Student self-refection in which a student has an opportunity to reflect on the rationale of a given classroom activity.
ii. Student reinforcement which entails the ability of a student to predict the outcome of the given activity.
iii. Assurance of a safe environment where a student feels free to express their ideas without being interfered.
iv. State of confidence which reflects student's ability to demonstrate a confidence to work independently and to collaborate with other fellows.

Self-assessment emphasizes students evaluating their own learning progress and comprehension during their studies, empowering them to take charge of their success and fostering a foundation for lifelong learning. It involves learners identifying a set of standards, applying them to their work, and judging how well they have met the criteria and performance standards (Pooh, McNaught, Ian & Kwan, 2009, cited in Khoarai, 2014). Similarly, Heritage (2007) emphasizes the importance of teaching students self-assessment practices. Teachers should instruct students on how to assess their own learning and that of others, which includes setting goals and success criteria, reflecting on understanding, and evaluating learning against the criteria. Simple strategies to engage students in self-assessment include prompting them to reflect on their performance with questions like, "Do you think your response demonstrated understanding? If so, why? If not, why not?" (p. 144).

Contrary to self-assessment, the peer-assessment strategy focuses on the role students can play in supporting other fellows' learning (Oswalt, 2013). It requires students to encourage and activate other peers to provide effective feedback or grades to other members of the classroom based on the criteria of excellence in which students may have been involved (Falchikov, 2005). Falchikov highlights the following advantages of peer assessment in teaching and learning;

i. It supports the notion of the gradual learning process and essence of a community of practice;
ii. It advocates students helping each other in the teaching and learning process;
iii. Evidence from research revealed that peer feedback is essential for effective development of students' writing and conversation skills;
iv. "Peer feedback" encourages cooperative learning through interaction of students in the classroom;
v. Peer assessment promotes deep learning and collaboration in other ways.

In addition, Wiliam (2004) observes that learners often find it difficult to understand the criteria for success that the teacher has in mind. Therefore, the involvement of peers can help learners understand success and monitor their progress. Peer assessment does not only complement self-assessment but may also require the effective utilization of self-assessment, and promotes constructive outcomes, especially when the given ideas reflect the existing context, objectives and curricular demand (William, 2004; Topping, 2005). Table 1 provides nine cells, which when combined constitute five "key strategies" of formative assessment.

2. Research Methodology

The data was collected from six private and six public secondary schools in Arusha city and Kinondoni municipality. The sample consists of 36 mathematics teachers, 18 from Kinondoni municipality and 18 from Arusha city. The study utilized a stratified sampling procedure to ensure representative categories of teachers based on class levels, gender, teaching experience, and educational qualifications. This was considered important for the teachers' implementation of peer and self-assessment in teaching and learning mathematics in secondary school in Tanzania. A non-parametric test was employed after the data met the four assumptions necessary for a valid Mann-Whitney U test. For quantitative data analysis, the Mann-Whitney U test and Kruskal-Wallis H test were used.

3. Results

The current study sought to assess teacher's utilization of self and peer-assessment in mathematics among secondary school teachers in Tanzania. In this case, the first part presents self-assessment and the second part the peer-assessment results.

A. Self-assessment practices of mathematics teachers in secondary schools

The assessment of self-assessment practices focused on three

Table 2
Kruskal-Wallis H test on utilization of self-assessment based on selected teachers' demographic attributes

	Measure	N	Mean Rank	χ^2	df	p-value
Qualifications	Diploma	11	21.68			
	Bachelor	21	18.05	2.659	2	0.265
	Master	4	12.13			
Teaching experience	1-5years	15	19.40			
	6-10years	7	11.57	4.164	2	0.125
	11+ years	14	21.00			
Number of Periods	Less than 20	13	17.81			
	Between 20-30	14	18.64	0.114	2	0.944
	30+	9	19.28			
Class Size	Below 40	3	21.67			
	Between 40-50	13	17.65	0.378	2	0.828
	50+	20	18.58			

Key: N= number of respondents, df= degree of freedom, p-value is significant at 0.05 level (2-tailed)

Table 3
Mann-Whitney U test on utilization of self-assessment based on teachers' sex, school type and in-service training status

Teachers' attributes	Measure	N	Mean Rank	Sum of Ranks	Mann-Whitney U test	Critical value	p-value
Sex	Male	25	17.58	439.50	114.500	80	0.416
	Female	11	20.59	226.50			
School type	Public	18	19.86	357.50	137.500	99	0.425
	Private	18	17.14	308.50			
Training status	Attend	22	19.39	426.50	134.500	93	0.515
	Not attend	14	17.11	239.50			

Key: *N= number of respondents.*

main aspects which were to assess the influence of teachers' demographic characteristics in encouraging self-assessment practices, analyse teachers' ability to encourage students' self-assessment and peer assessment.

1) The influence of teachers' demographic characteristics in encouraging utilisation of self-assessment practices

The study examined demographic characteristics that might have influenced teachers' utilization of self-assessment in mathematics in selected secondary schools. The main teachers' characteristics under study were qualifications, teaching experience, number of periods and class size. Table 2 presents Kruskal-Wallis H test for the utilisation of self-assessment for each measure.

The findings in Table 2 indicate that diploma teachers showed higher influence (mean rank $=21.68$) than bachelor's the level of influence diploma teachers obtained a mean rank = 21.68, bachelor degree (mean rank $=18.05$) and master degree holders (mean rank =12.13) although the results of inferential statistics concluded that educational qualifications had no significant influence in encouraging students to participate in self-assessment practices ($\chi^2(2,\ N=36)=2.659,\ p=0.265$). In terms of teaching experiences, the findings indicated that teaching experiences had no significant influence on the utilization of self-assessment practices in secondary schools ($\chi^2(2,\ N=36)=4.164,\ p=0.125$). However, teachers with more than 11+ years had more influence (mean rank $=21$) on student's utilization of the self-assessment practices as compared to those with teaching experience of 6-10 years (mean rank $=11.57$). The findings further revealed that, teaching load has no significant influence on the utilization of self-assessment practices in line with formative assessment in mathematics ($\chi^2(2,\ N=36)=0.374,\ p=0.828$). Thus, it can generally be concluded that demographic characteristics of teachers (educational qualifications, teaching experience, workload) has little influence on the utilization of self-assessment practices in mathematics in secondary schools. This can be associated with the fact that student self-assessment is often managed and practised by students themselves in the classroom and outside the classroom.

2) Teachers' ability to encourage students' self-assessment

The analysis of teachers' ability to promote student self-assessment in mathematics education considered factors such as teachers' gender, training status, school type, teaching experience, qualifications, number of periods, and classroom size. The results of this analysis, using the Mann-Whitney U test, are presented in Table 3.

A Mann-Whitney U test was performed to evaluate whether the effectiveness of practising self-assessment by students differed by gender. The results in Table 3 indicate that female teachers obtained a mean rank of 20.59 and male teachers obtained a mean rank of 17.58, with a critical value of 80 and *p*-value of 0.416. The results indicate that female teachers appeared to be more effective than male teachers in encouraging students to practise self-assessment in the classroom although the Man Whitney U test concluded that gender did not significantly encourage students to practice self-assessment ($p(80)=0.416,\ \alpha=0.05.$).

In terms of school type, the findings revealed that teachers from public schools obtained a mean rank of 19.86 and teachers in private schools had a mean rank of 17.14. The results showed that school type had no significant contribution in encouraging students to practice peer and self-assessment ($p(99)=0.425,\ \alpha=0.05$) although teachers from private schools had more influence (mean rank $=19.86$) than teachers from government schools (mean rank $=17.14$) in encouraging students to participate in self-assessment practices. Regarding the teachers' INSET training status, the result shows that trained and untrained teachers had no significant difference in encouraging students to participate in self-assessment practices

Table 4
Teachers' utilization of self- assessment aspects of formative assessment by items

	Observed Self-Assessment items	N	Mean	Std. Deviation
1	Does the teacher give students opportunities to use self-regulatory competencies, such as the ability to accurately assess their knowledge?	36	2.8333	0.65465
2	Does the teacher make efforts to develop self-monitoring competencies in students (meta-cognitive skills)?	36	2.6667	0.63246
3	Are students making decisions related to their own improvement based on ongoing assessment data (i.e., ownership of learning)?	36	2.5278	0.65405

Key: N= number of respondents

($p(93) = 0.515,\ \alpha = 0.05$) although teachers who received INSET training had higher influence (mean rank $= 19.39$) as compared to those who did not obtain INSET training (mean rank $= 17.11$).

The results indicate that teachers' characteristics, such as gender, school type, and training status, did not affect the use of self-assessment in mathematics education. This suggests that teachers do not have direct control over student self-assessment; their role is primarily to motivate and encourage students to engage in self-assessment practices.

3) Teacher's utilisation of self-assessment aspects of formative assessment practices

The study analysed the extent to which teachers utilize self-assessment aspects of formative assessment practices. Teacher's experiences were measured against three self-assessment practices which were the student's self-regulatory competencies, self-monitoring competencies, and student's monitoring of self-improvement. Table 4, presents the results.

Findings in Table 4 show that teachers generally were able to gave students opportunities to use self-regulatory competencies such as the ability to accurately assess their knowledge (M = 2.8333, SD = 0.65465), make efforts to develop self-monitoring competencies in students (M = 2.6667, SD = 0.63246), and encourage students to make decisions related to their own improvement, that is owning learning (M = 2.5278, SD =0.65405). The findings suggests that teachers were able to utilize the key self-assessment aspects of formative assessment practices during teaching and learning.

4) Relevance of mathematics curriculum materials in promoting utilization of self-assessment

Among the objectives of the study was to assess teachers' opinions regarding the relevance of mathematics curriculum materials in promoting utilization of self-assessment. Table 5 presents the findings from the questionnaires.

Table 5
Teachers' manual and description of management of student self-assessment

Teachers' Opinions	Frequency	Percent	Cumulative Percent
Strong Agree	10	16.9	16.9
Agree	8	13.6	30.5
Not Sure	26	44.1	74.6
Disagree	12	20.3	94.9
Strongly Disagree	3	5.1	100.0
Total	59	100.0	

The findings from Table 5 reveals that, 26 (44.1%) teachers were not sure about the usability of the usability of teachers' manual in promoting self-assessment in line with formative assessment, followed by 18 (30.5%) who either strongly or agrees and 15(25.4%) who were either strongly disagree or disagree. The findings indicate a partial understanding of teachers on the guidelines for effective management of student's self-assessment practices. The findings corroborate findings from teachers' interviews which shows that teachers were not aware of mathematics teachers' manual.

5) Mathematics teacher's views on the usability of textbooks in promoting self-assessment practices

Mathematics teachers were also required to provide views on the extent to which mathematics textbooks promote self-assessment practices. Table 6 presents mathematics teachers' views about the textbook.

Table 6
Mathematics textbooks in promoting management of student self-assessment

	Frequency	Percent	Cumulative Percent
Strong Agree	9	15.3	15.3
Agree	32	54.2	69.5
Not Sure	9	15.3	84.7
Disagree	9	15.3	100.0
Total	59	100.0	

The data in Table 6 reveals that 41(69.5%) teachers agreed on the usability of mathematics textbooks to promote student self-assessment in line with formative assessment, 9(15.3%) were not sure and disagreed. The findings suggest that textbooks activities promote and encourage strategies for implementing self-assessment in the classroom.

B. Teachers' ability to encourage peer assessment in the classroom

The last aspect of formative assessment according to Thompson and Wiliam (2007) is peer-assessment. Peer assessment practices were analysed based on teacher's demographic characteristics and their influence on encouraging students peer-assessment practices.

1) Teachers' demographic characteristics on the utilization of peer assessment

In this study, teachers' ability to encourage peer assessment in teaching and learning mathematics was analysed based on teachers' sex differences, training status, school type, teaching experience, qualifications, number of periods and classroom size. Table 7 presents the *Mann-Whitney U test* for teachers' attributes with three variables which were sex difference, training status and school type.

The Mann-Whitney U test results in Table 7 reveals that female teachers received higher mean rank (20.95) than male teachers (7.42) for the extent of utilization of peer-assessment practices. However, the test shows that there was no significant difference in the level of utilization of peer-assessment practices among male and female mathematics teachers ($p(80) = 0.341,\ \alpha = 0.05$). The findings suggest that a teacher's gender does not influence the extent of utilization of peer-assessment practices in mathematics classes in secondary schools.

Table 7
Mann-Whitney U test on utilization of peer-assessment based on teachers' sex, school type and in-service training status

	Measure	N	Mean Rank	Sum of Ranks	Mann-Whitney U test	Critical value	p-value
Sex	Male	25	17.42	435.50	110.500	80	0.341
	Female	11	20.95	230.50			
Training status	Attend	22	18.66	410.50	150.500	93	0.907
	Not attend	14	18.25	255.50			
School type	Public	18	20.61	371.00	124.000	99	0.217
	Private	18	16.39	295.00			

Key: *N= number of respondents, p-value is significant at 0.05 level (2-tailed)*

Table 8
Kruskal-Wallis H test on utilization of peer-assessment based on selected teachers' demographic attributes

	Measure	N	Mean Rank	χ^2	df	p-value
Qualifications	Diploma	11	17.73	2.698	2	0.259
	Bachelor	21	20.29			
	Master	4	11.25			
Teaching experience	1-5years	15	19.17	0.937	2	0.626
	6-10years	7	15.14			
	11+ years	14	19.46			
Number of Periods	Less than 20	13	16.92	0.924	2	0.630
	Between 20-30	14	18.25			
	30+	9	21.17			
Classroom Size	Below 40	3	7.83	62.76	2	0.043*
	Between 40-50	13	15.81			
	50+	20	21.85			

Key: *N= number of respondents, df= degree of freedom, * p-value is significant at 0.05 level (2-tailed)*

Table 9
Post-Hoc test Mann-Whitney U test on the utilization of feedback based classroom size

Measure	N	Mean Rank	Sum of Ranks	Mann-Whitney U test	Critical value	p-value
Below 40	3	5.17	15.50	9.500	4	0.160
Btw 40-50	13	9.27	120.50			
Btw 40-50	13	13.54	176.00	85.00	76	0.88
Above 50	20	19.25	385.00			
Below 40	3	4.67	14.00	8.00	8.00	0.046*
Above 50	20	13.10	262.00			

Key: *N= number of respondents, * p-value is significant at 0.05 level (2-tailed)*

Regarding the in-service training status, results show that teachers who attended in-service training obtained a higher mean rank (18.66) than those who did not attend (18.25). Nevertheless, the findings suggest that attending training does not have a significant contribution to the utilization of peer-assessment practices in secondary school mathematics classes $(p(94) = 0.907,\ \alpha = 0.05)$. When examined in terms of school type, the findings revealed that there is no significant difference in the utilization of peer-assessment practices between government and private schools $(p(99) = 0.217,\ \alpha = 0.05)$. Therefore, the findings shows that none of the three measures influenced teachers' utilization of peer-assessment in teaching and learning mathematics.

Furthermore, *Kruskal-Wallis H tests* was carried out for teachers' attributes with three variables such as qualifications, teaching experience, number of periods and class size. Table 8 presents the findings for each measure.

The data from Table 8 reveal that, bachelor's degree holders received the highest mean rank (20.29) followed by diploma holders (17.73) and master's degree received the lowest mean rank (11.2). The results also show that education level of mathematics teachers does not have significant influence on their utilization of peer assessment practices $\left(\chi^2(2,\ N = 36) = 2.698,\quad p = 0.259\right)$. The finding suggests that academic qualifications did not influence teachers' utilization of peer-assessment in teaching and learning mathematics.

Similarly, results from teaching experience showed that teachers who taught for more than 11 years received the highest mean rank (16.46), followed by those who taught between 1-5 years (16.17) and the last were the teachers who taught between 6-10 years (15.14) although the differences were not statistically significant $\left(\chi^2(2,\ N = 36) = 0.937,\ \ p = 0.626\right)$.

Regarding classroom size, the findings indicated that teachers with more than 50 students obtained the highest mean rank (21.85) followed by those with 40-50 students (15.81) and teachers with periods below 40 received the lowest rank (7.83). The results show also that class size has a significant influence on the utilization of peer-assessment practices among mathematics secondary school teachers $\left(\chi^2(2,\ N = 36) = 62.76,\ \ p = 0.043\right)$.

The multiple comparisons (Post-Hoc test) analysis was also conducted to find out groups that are statistically significant regarding the classroom size. Table 9 presents Mann-Whitney U test results for the classroom size.

Findings from Table 9 indicate that, classroom with less than 40 students obtained a mean rank = 4.67 and classroom with students more than 50 obtained a mean rank = 13.10 with critical value = 8.00 and p-value = 0.046, which were statistically significant at $\alpha = 0.05$ level of confidence.

This finding revealed that teachers with larger class sizes were more effective in using peer assessment in mathematics education compared to those with smaller class sizes. This

Table 10
Teachers' utilization of peer–assessment aspect of formative assessment by item

	Observed Peer-assessment- items	N	Mean	Std. Deviation
1	Does the teacher give students opportunities to engage in peer monitoring (discussions, questions, learning tasks)?	36	2.6111	0.64488
2	Does the teacher utilize the results of peer activities to strengthen ongoing assessment of student learning?	36	2.5000	0.60945
3	Does the teacher utilize peer activities to help students deepen their understanding of common errors and alternative strategies?	36	2.3333	0.67612

Key: *N= number of respondents*

suggests that class size did not impact teachers' use of peer assessment in the teaching and learning process. Additionally, it indicates that peer assessment was not influenced by teachers' qualifications, teaching experience, number of periods, or class size in the context of teaching mathematics.

In the same vein, the researcher observed teachers involvement in encouraging students to practise peer-assessment in different ways such as allowing students to correct their fellows when doing assignment on the blackboard. In addition, the researcher conducted analysis to examine how teachers utilized each item in the aspect of peer-assessment in teaching and learning mathematics.

2) Teacher's influence on students practices of peer-assessment

The study sought to observe teachers' involvement in encouraging students to practise peer assessment in different ways such as allowing students to correct their fellows when doing assignments on the blackboard. The study examined how teachers utilized each of the aspects of peer assessment in teaching and learning mathematics. Table 10 presents the results for each aspect of peer assessment.

The data from Table 10 reveal that majority of teachers provided opportunities for students to engage in peer monitoring activities (M = 2.6111), followed by those who agreed that they utilize the results of peer activities to strengthen the ongoing assessment of student learning (M = 2.5000), and the last group of teachers agreed that they utilize peer activities to help students deepen their understanding of common errors and alternative strategies (M = 2.3333). Thus, it can be concluded that mathematics teachers in secondary schools were fairly utilizing the aspects of peer assessment practices in line with the formative assessment practices.

4. Discussion of the Main Findings

The present study intended to determine the extent to which mathematics subject teachers encouraged and motivated students to practice self-assessment and peer assessment in the classroom. The finding from the study revealed insignificant variation in the utilization of peer and self-assessment practices caused by demographic characteristics of gender, educational qualifications, prior in-service training, teaching experiences, class size and the number of periods. These findings concur with earlier findings by Yan et al. (2022) who observed that demographic characteristics such as age have an impact on student learning especially when both self and peer assessments are used simultaneously although other demographics are still unclear in their direct effects. Some other studies have also shown that highly experienced teachers may be outperformed by less experienced teachers. For example, Martina, Melissa & Hanadi (2019) examined if teaching experience makes a difference in teaching quality and observed that teachers with average experience (5-10 years) had higher chances of employing inquiry-based and student-centred teaching approaches as required in Abu Dhabi government schools. Such practices of novice or moderately experienced teachers may be associated with pre-service instructions, self-studies or in-service professional development.

Findings in this study indicated that class size does not affect self-assessment. These findings concur with earlier findings by Duncan and Noonan (2007) who reported that class size was not a significant factor in teachers' grading and classroom assessment practices in secondary schools in Canada. While the findings seem to reflect the fact that self-assessment is a personal endeavour, some other studies have reported an effect of class size on the implementation of self-assessment. For example, contrary to the findings of the current study, Biddle and Berliner (2002) observed that class size reduction was advocated as a tool for enhancing student achievement by increasing the opportunities that teachers and students have to interact around relevant content, reducing disciplinary disruptions, and enriching teacher knowledge of students' strengths and weaknesses.

Contrary to self-assessment, peer assessment was significantly influenced by the class size. Numerous studies consistently support the idea that as the class size decreases, the more efficient are the learning experiences (Wright, Bergom, & Bartholomew, 2019). In Tanzania, large class size is mentioned as one of the challenges which hinders the effective implementation of learner-centred approaches. Overcrowded classes are reported to hinder effective classroom assessments, application of interactive teaching methods, and inadequate mastery of content, competencies and skills (Kadelya, 2021; Senyagwa, 2021; Tilya & Tarmo, 2014).

Also, the study revealed that teachers' utilization of self-assessment and peer-assessment varied insignificantly with the number of periods.

In-service training was not found to affect the utilization of self-assessment and peer assessment. These findings are in line with Karaman (2021) who reports that variables such as educational level, assessment criteria type and self-assessment training have no significant effect on academic performance. Nevertheless, the findings provide an alarm for tailored training in these assessment areas. Thompson and Wiliam (2007) note that self-assessment and peer assessment should be used by students themselves in the classroom. Evidence from interview sessions revealed that most teachers were unable to conceive the concepts of self-assessment and peer assessment. However, during classroom observations, it was observed that some teachers provided opportunities for students to assess their fellows during classroom presentations although its

implementation was not directly aligned with the best practices for implementing peer and self-assessment. Self-assessment and peer assessment can be encouraged by the teacher by using strategies such as challenging tasks, effective questioning, group work and student interactions in the process of teaching and learning (Black & Wiliam, 1998a).

Regarding teacher's qualifications, it was revealed that teachers' qualifications did not affect the utilization of self-assessment and peer assessment. This finding contradicts the finding from the study by Rice (2003) and Kabiru (1993) who revealed that teachers with advanced degrees in mathematics and science are positively related to effective classroom practices though this evidence does not apply more broadly to other academic subjects or grade levels.

A. Recommendation

The findings from this study indicate that there was insignificant variation of the influence of teachers' demographic characteristics on teachers' utilization of self-assessment and peer-assessment except for class size in peer assessment where a significant variation was observed. Thus, based on these findings, the study recommends the following:

1. Tanzania Institute of Education should prepare tailored in-service training on effective implementation of peer and self-assessment as important aspects of formative assessment. It should be noted that formative assessment is one of the key elements of learner-centred teaching and learning which is highly advocated by the institute.
2. Pre-service teacher trainings should consider effective facilitation and provide a priority of formative assessment, and in particular peer and self-assessment practices.
3. Further studies can be conducted to analyse the relationship between peer and self-assessment practices and how both influences academic performance of students in mathematics and other subjects.
4. A quasi and experimental studies can be conducted in secondary schools to compare and contrast the effect of demographic characteristics of teachers and leaners on the effectiveness of the utilisation of peer and self-assessment on academic achievement of students.

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