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Influence of Heuristic Mathematics Teaching Method towards Students' Performance in Public Secondary Schools in Moshi District, Tanzania

Valence Rwehabura

Student, Bachelor of Education in Science, Mwenge Catholic University, Tanzania

Evastela Kaponga

Assistant Lecturer, Faculty of Education, Mwenge Catholic University, Tanzania

Abstract:

This study was conducted to investigate the influence of heuristic mathematics teaching methods on students' performance in public secondary schools in Moshi District, Tanzania. The study was guided by Constructivism learning theory, which was pioneered by Jean Piaget (1936). The study employed a quantitative research approach whereby a cross-sectional survey design was used. The study's target population was 61 public secondary schools, 73 mathematics teachers, and 28,134 students in Moshi District. Six schools and twelve teachers were selected using a straightforward random selection procedure, and 394 pupils were chosen using Slovin's formula. Both mathematics teachers and students were given access to quantitative tools (questionnaires). The reliability of Likert scale items was determined by the Cronbach Alpha technique. The collected data was sorted and analysed by using the Statistical Package for Social Sciences (SPSS – version 20) computer software. The study found that heuristic teaching method has a positive contribution towards students' performance. The researcher concluded that heuristic teaching method used by mathematics teachers had a large number of contributions to students' learning of mathematics. According to the study's recommendations, the government should make sure that mathematics teachers have access to training programs on using heuristic teaching techniques to boost students' performance.

Keywords: Influence, Heuristic teaching method, Mathematics, Students' performance

1. Introduction

Public secondary schools are intermediate-level educational establishments that are owned and operated by the government in Tanzania. They last six years after elementary school and come before the university level. Learning is the process by which a teacher transmits knowledge to a student. This is only a superficial understanding that sees the teacher as the source of knowledge while the student is still merely a passive recipient of it. As a result, the student's active role in making learning a reality is somewhat neglected in favour of the teacher's importance (Azmidar et al., 2017). Active learning not only assists the learner in developing the necessary skills and applying what they have learned in class to the real world, but it also improves the students' performance in their respective topics, as Daly-Smith et al. (2018) corroborate. At the local, regional, and international levels, math performance has declined. For instance, Tambunan et al. (2021) claim that mathematics student performance in Indonesia is a concern. The subject of mathematics has historically performed poorly in the West Africa Senior Secondary Certificate Examination in Sub-Saharan Africa, where it is a crucial component of the school curriculum and is generally regarded as a requirement for admission to tertiary institutions (Arthur et al., 2022).

The same is true for Tanzania, where mathematics is taught in secondary schools as one of the core subjects, along with geography, Kiswahili, English, civics, history, physics, chemistry, and biology. Every student must initially study each subject concurrently until they pass form two, at which point they are free to choose at least seven subjects, with mathematics being a prerequisite (Mazana et al., 2020). The children's poor performance in mathematics has raised serious concerns among government officials, mathematical institutions, instructors, and parents despite this type of strategy. The minister for Education, Science, and Technology, Prof. Adolph Mkenda, was recently cited as saying, "The challenge of mathematics is a disastrous challenge in Tanzania."

Furthermore, Dr. Said Sima, a former chair and current national secretary of the Mathematics Association of Tanzania, once remarked that poor performance in mathematics has been a prolonged cry. However, it appears to fall on deaf ears because no one is determined to find a solution (Mwananchi, March 21, 2017). Additionally, according to Mazana et al. (2020), the majority of teachers acknowledge that the employment of ineffective instructional tactics is one of the reasons why pupils receive poor grades in mathematics. Teachers

claimed that the majority of the time, they employ teacher-centered techniques, which exclude student engagement and limit pupils' ability to learn mathematics: "The methodology we use, the teacher-centered approach, still persists...It significantly contributes to our errors since teacher-centered education does not consider students' abilities and roles in the learning process."

Moreover, it was reported that parents also continue raising their voices following their discontentment with the poor performance of their children in mathematics, whereby some of the parents think of themselves as accountable for not fulfilling their duty of making the follow-up and encouraging their children to learn mathematics through doing enough exercises, especially when they are back home from school (Mwananchi, October 6, 2021). Table 1 shows Form Four Mathematics National examination results of some schools, which are just presented as examples, for five years (2018, 2019, 2020, 2021, and 2022) as an indication of students' poor performance in Moshi District. Table 1 is evident.

Year	Schools	Total Candidates	Failed Candidates	GPA
2018	A	107	99	4.9065
	B	39	39	5.0000
	C	76	72	4.9079
	D	118	39	4.5424
	E	91	83	4.8791
	F	63	54	4.8791
2019	A	76	66	4.8553
	B	57	52	4.8947
	C	64	59	4.8906
	D	111	81	4.6126
	E	97	85	4.8144
	F	60	53	4.8000
2020	A	108	100	4.8981
	B	86	77	4.8837
	C	75	68	4.9067
	D	143	121	4.7692
	E	94	79	4.7660
	F	67	43	4.4627
2021	A	120	95	4.6833
	B	120	93	4.6917
	C	58	53	4.8793
	D	132	86	4.4697
	E	87	71	4.7241
	F	64	56	4.8125
2022	A	119	93	4.6555
	B	96	83	4.8021
	C	74	63	4.8108
	D	151	83	4.2252
	E	102	89	4.8137
	F	76	64	4.7237

Table 1: Form Four Mathematics National Examination Results for Five Years: Examples of Schools Showing Students' Poor Performance in Moshi District
Source: National Examination Council of Tanzania

Table 1 shows that a large number of students (averagely more than half of all candidates) fail their form four mathematics national examination, and the corresponding GPA is high (averagely greater than 4.5). This is clear evidence of poor performance in mathematics examinations among students in public secondary schools in Moshi District because the higher the GPA, in this case, the poorer the performance. That being the case, the researcher's concern in this study is about the role that he supposes mathematics teachers can play in raising the performance among students, especially through the teaching methods they choose to employ. The researcher is worried about which methods the teachers choose and how they are being applied. Many studies put forward several mathematics teaching methods, including lecture, analytic, synthetic, heuristic, laboratory, problem-solving, and project methods (Baig, 2015). From these methods, the researcher selected heuristic method to be part of this study.

Heuristic method is a discovery method that has its etymology in Greek, *heurisko*, with the meaning "I find out" or "I discover." The method is based on child psychology, according to which every child desires to discover things by himself/herself. By this method also, the students are encouraged to discover the solution by themselves under the guidance of a teacher, the reason why it is also called the guided discovery method or programmed instruction. The method is student-centred and it builds the confidence of the students as they discover the solutions on their own (Baig, 2015).

According to some related literature, Mazana et al. (2020), Areelu and Ladele (2018), and others, mathematics teaching quality has a direct positive effect on students' performance in mathematics. Jigsaw is one of the teaching strategies found to be most effective compared to traditional methods and individual personalization. However, the jigsaw is just one strategy among others, which can be applied with heuristic method so that the students can easily be familiarized with the contents of instruction and be able to construct new knowledge based on their previous knowledge (Baig, 2015). This study investigated the influence of heuristic mathematics teaching methods on students' performance in public secondary schools in Moshi District.

1.1. Statement of the Problem

Tanzanian secondary school pupils' poor math proficiency is concerning because they consistently outperform their peers in other areas on national exams. This unpleasant fact is being lamented by government representatives, educators, students, parents, and members of the community (Mazana et al., 2020). The lack of mathematical knowledge and skills, which are an essential component of human life and professional delivery, will have an impact on both professionals and everyday citizens if this issue is not addressed in the educational setting. Everyday tasks, including shopping, cooking, keeping track of time, playing video games, and conducting scientific studies, involve the usage of mathematics (Yurt, 2022). The entire country will see more negative effects due to rivalry with the global economy. Several studies, including those by Tambunan et al. (2021), Mazana et al. (2020), and Arthur et al. (2022), were carried out to address this issue. The majority of these studies demonstrate that mathematics teachers' activities have a direct impact on students' performance and motivation. However, they do not identify the precise activities that had this impact and do not only pay attention to students' performance. Hence, this study investigated the influence of heuristic mathematics teaching methods on students' performance in public secondary schools in Moshi District, Tanzania.

1.2. Research Question

This study was guided by the following research question:

- What is the contribution of heuristic teaching method used by mathematics teachers to enhance students' performance in public secondary schools in Moshi District?

1.3. Theoretical Framework

According to the theory, students actively create their own knowledge, and their experiences shape their perception of reality. As a result, each individual learner constructs knowledge on the basis of their prior experiences and expertise while interacting with new information. The idea supports active learning since it contends that information is produced rather than innate or passively assimilated (Tomljenovi & Tatalovi Vorkapi, 2020).

1.3.1. Strengths of the Theory

The constructivism theory favours active learning over the passive consumption of information. Advanced skills like critical thinking, analysis, creativity, and evaluation are developed as a result. It enables students to think, analyse their work, and decide which intermediate skills they should learn depending on their actual needs. It also supports a diversity of perspectives. The approach reflects the wide availability of content in our contemporary society (Dover, 2018).

1.3.2. Weaknesses of the Theory

Constructivism theory lacks structure, which means that it fails to have a specific way of learning which fits all students. While the theory presupposes students' prior knowledge on which they continue to build new experiences, such knowledge and background for each one differs from others. The learner can then be hampered, at least initially, to draw abstractions and transfer knowledge and skills in new situations. Some students, indeed, require a highly structured environment to be able to excel (Dover, 2018).

1.4. Application of the Theory to the Study

The theory served the researcher well because it is closely related to the heuristic teaching approach, which emphasizes active and independent learning. The theory suggests using learner-centered teaching strategies that encourage a discovery-oriented learning environment, similar to how heuristic teaching strategies do.

2. Review of Empirical Studies

Heuristic teaching method used by mathematics teachers contributes to enhancing students' performance in public secondary schools.

Kaitera & Harmoinen (2022) did a study on Developing mathematical problem-solving skills in primary schools by using visual representations of heuristics. The study intended to find out whether a teaching approach that focuses on teaching general heuristics for mathematical problem-solving would improve students' performance in tasks and skills in justifying their reasoning. Data were collected from 25 fifth graders' pre-tests and post-tests with non-routine mathematical tasks analysed. The results indicated that the teaching approach, which emphasized finding different approaches to solve mathematical problems, had the potential for improving students' performance in a problem-solving test and skills, but also in explaining their thinking in tasks. The study found that heuristic teaching approach improved students' performance in mathematics.

Murat, Seda & Ruken (2021) conducted a study on Effect of an Instructional Design Based on the Algo-Heuristic Theory of Instruction on Students' Mathematics Performance and Logical Thinking AHTI Skills. The research was

grounded in mixed methods. In the quantitative part of the research, there was a quasi-experimental design including pre-test, post-test, retention test and retention monitoring test with experimental, placebo and control groups used, while the qualitative section was based on a case study. The quantitative and qualitative data of the study revealed that with the effect of the instructional design based on the AHTI, the mathematics performance of students in the experimental group increased and that their logical thinking skills were positively impacted. The researcher indicated that the mathematics performance of students in the experimental group increased, and their logical thinking skills were positively impacted by the effect of the instructional design based on the AHTI.

The reviewed studies (Kaitera & Harmoine, 2022; Murat, Seda & Ruken, 2021) indicated that heuristic teaching approach improved students' performance in Mathematics and their logical thinking skills. Moreover, these studies were conducted outside Tanzania and disclosed that the strategy needs to be improved, which could be done by mathematics teachers. Therefore, this study investigated the Influence of Heuristic Mathematics Teaching Method Towards Students' Performance in public secondary schools in Moshi District, Tanzania.

3. Methodology

The study employed a quantitative research approach where a cross-sectional survey design was used. The target population was 61 public secondary schools, 73 mathematics teachers and 28,134 students. Simple random sampling techniques were used to obtain 6 schools and 12 teachers. Slovin's formula was used to obtain 394 students. The total sample of respondents was 408. Questionnaires were used for both mathematics teachers and students. The content validity of the instruments was determined by experts from MWECAU. The reliability of the instruments was determined by using Cronbach Alpha method, measured in Likert scale ($r = 0.797$ and $r = 0.963$ for students and teachers, respectively).

4. Presentation and Discussion of Findings

4.1. The Contribution of Heuristic Teaching Method Used by Mathematics Teachers to Enhance Students' Performance in Public Secondary Schools

The study sought to find out the contribution of heuristic teaching method used by mathematics teachers to enhance students' performance in Public secondary schools in Moshi District. The responses were collected from mathematics teachers and students. The researcher investigated several aspects of heuristic teaching method used by mathematics teachers that could be the mechanism for raising students' performance. The responses are summarized in tables 2 and 3.

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
	F	%	f	%	F	%	F	%	f	%
I guide students to discover the solution by themselves	1	8	3	25	1	8	6	50	1	8
I build students' confidence in searching for a solution	0	0	0	0	3	25	4	33	5	42
I promote active learning among students	0	0	2	17	1	8	3	25	6	50
I assist students to construct their own knowledge	0	0	2	17	2	17	4	33	4	33
I guide students to think systematically towards the solution	1	8	2	17	0	0	5	42	4	33
I create a supportive learning environment	0	0	1	9	2	18	4	36	4	36
I provide reality-based tasks to the students	0	0	1	8	2	17	3	25	6	50
I make the lesson enjoyable to the students	0	0	1	8	4	33	1	8	6	50
I encourage creativity among students	1	8	1	8	2	17	5	42	3	25
I promote students' self-dependence	0	0	2	17	3	25	5	42	2	17

Table 2: Summary of Mathematics Teachers' Response to the Contribution of Heuristic Teaching Method Used by Mathematics Teachers to Enhance Students' Performance in Public Secondary Schools N=12

Source: Field Data, 2023.

Key: N =Number of Respondents, F = Frequency, and %=Percentages

Data from table 2 revealed that while 33% of math teachers claimed they were unable to help students find the solution on their own, 58% of math teachers felt that they guided pupils to do so. These results suggest that not all math

teachers in Moshi District encourage their students to figure out the answer on their own. This might be explained by some math professors' assumption that their job is to get or provide students with ready-made answers. Neglecting this approach runs counter to Liljedahl's (2005) findings that an AHA! Event has a transforming effect on students who are "resistant" or "phobic" to mathematics, resulting in positive beliefs and attitudes towards the subject as well as improved performance.

According to the data in table 2, 75% of mathematics teachers encouraged their pupils to look for solutions, whereas 25% were unsure whether they did so or not. This indicates that the majority of math instructors in Moshi District give their students the confidence to look for solutions on their own to improve their arithmetic skills. The results of this study are supported by Capuno et al.'s (2019) findings, which show that low levels of motivation and self-confidence lead to low standards in students' performance.

From the data in table 2, 75% of mathematics teachers who participated in the study agreed that they promote active learning among students, while 17% of mathematics teachers had a contrary opinion on the statement. This means that most of mathematics teachers in Moshi District promote active learning among students to raise their performance. The findings are supported by Constructivism theory of learning, which asserts that knowledge is neither innate nor passively absorbed but constructed by individuals through active learning.

Based on the data in table 2, 66% of the math teachers who took part in the study said they helped their students create their own knowledge, whereas 17% gave alternative answers. It can be claimed that not all math instructors in Moshi District are aware of how crucial it is to help students build their own expertise. The results are compared to AHTI, which holds that students are left to solve the issues on their own while the teacher aids or encourages learning with recommendations and demonstrations of processes. According to the findings in table 2, 75% of mathematics teachers agreed that they help their students think methodically toward a solution, whereas 25% disagreed. This depicts the vast majority of math instructors in the Moshi district.

The data in table 2 indicated that 75% of mathematics teachers agreed that they provide reality-based tasks to the students and 17% of mathematics teachers were undecided about this statement. This implies that most of the mathematics teachers in Moshi District provide reality-based tasks to their students in an endeavour to enhance their performance. The results support Hånze & Leiss's (2022) findings that teachers must involve their pupils with more real-world assignments to foster their interest in mathematics and support their academic success.

Table 2 presents mathematics teachers' responses, which show that 58% of the mathematics teachers make the lesson enjoyable to the students and 33% of them were not sure whether they make the lesson enjoyable to the students or not. This implies that there are still a good number of mathematics teachers in Moshi District who are less committed to making their mathematics lessons enjoyable for the students, taking for granted, perhaps, that it could not hamper the desired standard of students' performance. The findings of this study, however, are contrasted with the findings by Yabo (2020), for he found out that the joyful and traditional approaches to teaching elementary algebra, specifically linear inequalities and functions, significantly improved the academic performances of the students.

According to the data presented in table 2, 67% of mathematics teachers agreed that they encourage creativity among students, while 17% are not sure whether they encourage creativity among students or not. From these findings, it can be said that the majority of mathematics teachers in Moshi District understood the importance of encouraging creativity among students since this is likely to enhance students' performance. The findings concur with Schoevers et al. (2022), whose study findings indicated that creativity is significantly related to performance, as students with higher levels of creativity performed better in solving geometry problems in general, but especially in geometry problems, asking for multiple solutions.

According to data presented in table 2, 59% of mathematics teachers agreed that they promote students' self-dependence, while 25% were undecided. These findings show that not all mathematics teachers in Moshi District promote students' self-dependence. The findings might be attributed to some attitudes of dominance on the students by mathematics teachers, neglecting the promotion of students' self-dependence for better performance. This is contrary to the findings made by Pratiwi et al. (2018), who concluded that self-efficacy and independence in learning mathematics impacted better results of learning achieved by the students.

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Mean
	F	%	f	%	F	%	f	%	f	%	
My mathematics teacher guides students to discover the solution by themselves	25	7	46	12	41	11	137	36	130	34	3.8
My mathematics teacher builds students' confidence in searching for a solution	16	4	22	6	16	4	130	34	193	51	4.2
My mathematics teacher promotes active learning among students	12	3	16	4	38	10	132	35	174	46	4.2
My mathematics teacher assists students in constructing their own knowledge	21	6	39	10	36	9	137	36	144	38	3.9

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Mean
	F	%	f	%	F	%	f	%	f	%	
My mathematics teacher guides students to think systematically towards the solution	17	4	35	9	46	12	144	38	133	35	3.9
My mathematics teacher creates a supportive learning environment	22	6	54	14	46	12	134	35	119	31	3.7
My mathematics teacher provides reality-based tasks to the students	32	8	37	10	49	13	118	31	136	36	3.8
My mathematics teacher makes the lesson enjoyable for the students	28	7	43	11	40	11	110	29	156	41	3.9
My mathematics teacher encourages creativity among students	18	5	47	12	44	12	142	37	124	33	3.8
My mathematics teacher promotes students' self-dependence	28	7	56	15	32	8	117	31	144	38	3.9
Grand Mean											3.91

Table 3: Summary of Students' Response to the Contribution of Heuristic Teaching Method Used by Mathematics Teachers to Enhance Students' Performance in Public Secondary Schools N=379

Source: Field Data 2023.

Key: N = Number of Respondents, F = Frequency, and % = Percentages

Data from table 3 showed that 70% of students agreed that their mathematics teachers guide them to discover the solution by themselves, while 19% of students said that their mathematics teachers were unable to guide them to discover the solution by themselves. The meaning is that a good number of students in Moshi District say that their mathematics teachers guide them to discover the solution by themselves. This is in line with the response given by mathematics teachers who had it that most of them guide students to discover the solution by themselves. The reason behind this could be that both the students and mathematics teachers have the idea that in discovering the solution by themselves, students do improve their understanding and consequent performance in mathematics. The findings of this study are similar to the findings made by Ishartono et al. (2019), asserting that students have to discover the solution by themselves to reduce rote learning and improve their retention level.

From the data in table 3, it was shown that 85% of students agreed that their mathematics teachers build students' confidence in searching for the solution, while 10% of the students said that their mathematics teachers were not building students' confidence in searching for the solution. This means that the majority of students in Moshi District assert that their mathematics teachers build students' confidence in searching for the solution. These results concur with those shown by mathematics teachers that most of them build students' confidence in searching for the solution. This is likely to improve students' performance, as the findings are equivocal with the findings of the study done by Parsons et al. (2009). In Parson's study, a regression model was produced, which predicted a 5% increase in marks for each increase in confidence level. Thus, students' confidence produced a notable association with their performance.

From the data in table 3, 81% of students who participated in the study agreed that their mathematics teachers promoted active learning among them, while 10% of the students were undecided. It is meant here that the majority of students in Moshi District agree that their mathematics teachers promote active learning among students. The students' responses in this regard agree with the responses given by mathematics teachers that most of mathematics teachers in Moshi District promote active learning among students to raise their performance. The findings are supported by Freeman et al. (2014) since their findings revealed that active learning increases students' performance in science, engineering, and mathematics.

Data in table 3 showed that 74% of students who participated in the study responded that their mathematics teachers assisted them in constructing their own knowledge, while 16% had different responses. It means that a good number of students in Moshi District assert that their mathematics teachers assist them in constructing their own knowledge. The responses concur with mathematics teachers' responses that the majority of them in Moshi District understand the importance of assisting students to construct their own knowledge in enhancing students' performance. Authenticity to these findings is accorded by the Constructivist theory of learning, by which meaningful and effective learning is attained when students are given the opportunity to construct their own knowledge.

Data in table 3 indicate that 73% of the students said that their mathematics teachers guide them to think systematically towards the solution, while 13% had a contrary opinion. This means that most of the students in Moshi District acknowledge their mathematics teachers for guiding them to think systematically towards the solution. The responses given by students agree to the responses given by mathematics teachers, such that the majority of mathematics teachers in Moshi district guide students to think systematically towards the solution to improve students' performance.

The findings agree with Alahmad (2020), who said that systematic thinking contributes to the learners' understanding of the information gained and how they obtained it, thereby enhancing their mathematical performance.

Data in table 3 indicate that 66% of students agreed that their mathematics teachers create a supportive learning environment, while 20% of students took a different position. This is to say that some students in Moshi District assert that their mathematics teachers exclude creating a supportive learning environment from their teaching strategies. The findings agree to the responses given by the mathematics teachers, which indicated that not all mathematics teachers in Moshi District create a supportive learning environment, which could be due to some mathematics teachers' emotional conviction that the strategy does not matter in enhancing students' performance. The findings are similar to those of Mazana et al. (2020), which revealed that the majority of mathematics teachers possess mixed emotions towards the teaching-learning environment.

Data in table 3 indicate that 67% of the students agreed that their mathematics teachers provide reality-based tasks to the students, and 18% of students said that their mathematics teachers were not in a position to provide reality-based tasks to the students. This means that not all students in Moshi District confirm that their mathematics teachers provide reality-based tasks to them. The findings agree with those obtained from mathematics teachers that not all of them in Moshi District embark faithfully on this kind of teaching/learning strategy, maybe because of minimal understanding of its outcomes. These findings are contrary to those obtained by Tohir et al. (2020), that reality-based tasks improve students' mathematical thinking.

Table 3 presents students' responses, which show that 70% of the students agree that their mathematics teachers make the lesson enjoyable to them, and 18% of them disagree to the statement. This means that not all students in Moshi District confirm that their mathematics teachers make the lesson enjoyable to them. These results lie in line with the responses of mathematics teachers, which reveal that some of them in Moshi District bother less about the need to make their mathematics lessons enjoyable to the students. These findings are contrary to Yabo's (2020), which tells us categorically that mathematics lessons should be more fun and joyful, both for students and teachers, to avoid boredom and get students much more involved and active in learning.

According to the data presented in table 3, 70% of the students agreed that their mathematics teachers encouraged creativity among them, while 17% of students indicated the contrary. It can be said that the majority of students in Moshi District agree that their mathematics teachers encourage creativity among them, and in this regard, they concur with their mathematics teachers whose responses were similar. This could be attributed to the fact that the role of creativity in raising students' performance is renowned to the majority of mathematics teachers as well as students in Moshi District. The findings concur with the study by de Vink et al. (2022), which revealed that creativity plays the role of improving mathematics performance through divergent and convergent thinking.

The data presented in table 3 indicate that 69% of students agreed that their mathematics teachers promote students' self-dependence, while 22% of the students disagreed. It means that some students in Moshi District have reservations about the statement. This concurs with the findings exposed on the side of mathematics teachers that not all of them were good at promoting students' self-dependence. The reason behind this scenario is possibly based on the lack of awareness among some mathematics teachers and students in Moshi District about the importance of self-dependence in learning. This contradicts the theory of Constructivism, which suggests that knowledge is created by the learner rather than being imparted or transferred by the teacher.

5. Conclusion

The study found that the heuristic teaching method has a positive contribution to students' performance since it enables mathematics teachers to provide reality-based tasks to the students. It guides students to develop their knowledge and creativity and come up with new discoveries to get the correct answers. Mathematics teachers promote students' active learning and self-dependence. However, some teachers lack awareness of the use of heuristic teaching methods, leading to poor performance among students. The researcher concluded that the heuristic teaching method used by mathematics teachers had a large number of contributions to students' learning of mathematics. Hence, there is a need to make more effective use of this method to achieve positive results, especially in enhancing students' performance in mathematics.

6. Recommendations

In view of the findings and conclusion of this study, the following recommendations were made:

- Heads of schools in Moshi District should provide seminars and workshops to mathematics teachers on using heuristic teaching methods to improve students' performance.
- The government should allocate funds for seminars and workshops for mathematics teachers on using the heuristic teaching method.

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