INSTITUTE OF ADULT EDUCATION

Journal of Adult Education in Tanzania
JAET June 2025, Vol. 27, Issue 1 pp. 155-169
eISSN: 2961-6271 (Online) Copyright © The Author(s)
Published by IAE
DOI: https://doi.org/10.61408/jaet2025v27i01.09

Impact of Teaching Methods on Stage II Students' Academic Performance in Mathematics: A Case of Alternative Secondary Education Pathway Programme in Mbozi and Momba Districts

Simon Michael Moses

Institute of Adult Education

Email: *simon.moses@iae.ac.tz/simionmorem@gmail.com*

Abstract

This study examined the relationship between teaching methods and the academic performance of Stage II students in mathematics within the framework of the Alternative Secondary Education Pathway (ASEP) programme. A mixed-methods approach, incorporating both exploratory and descriptive research designs, was employed. The research was conducted in Mbozi and Momba Districts of the Songwe Region, targeting a population of 156 individuals. A sample of 40 participants was selected using purposive and simple random sampling techniques. Four ASEP centres were purposively chosen from the two districts based on their consistently low academic performance in mathematics. Data collection methods included interviews, observations, and questionnaires. Qualitative data obtained through interviews and observations were coded and analyzed thematically, while quantitative data from questionnaires were presented in tabular form. The findings revealed that active teaching methods such as project-based learning, experiments, educational games, problem-solving, and brainstorming are effective in fostering critical thinking and enhancing students' performance in mathematics. However, these methods are infrequently utilized by teachers. Conversely, teachers demonstrated high proficiency in traditional methods such as lecturing and question-and-answer techniques, but exhibited limited skills in implementing brainstorming and problem-solving strategies, which are crucial for developing critical thinking.

Keywords: *Teaching methodologies, academic performance, Alternative Secondary Education Pathway*

Introduction

Mathematics has played a significant role in advancing many areas of human activity. It is a vital subject for students, especially those aiming for careers in fields that require strong quantitative skills. Mathematics is closely connected to other subjects, particularly in technical and scientific disciplines. A solid foundation in mathematics gained during secondary education is important for students who plan to study science, technology, or artificial intelligence (AI) at the university level. This strong background helps students succeed in higher education (Gravemeijer et al., 2017).

Despite the important role mathematics plays and the government's efforts to promote mathematics and science subjects, student performance in mathematics at the secondary school level in Tanzania remains low (Mazana et al., 2020). Many students struggle with the subject, resulting in poor academic achievement and fewer opportunities for future success (URT, 2024). A significant number of students continue to have difficulty achieving even a "D" grade in national examinations (Mateya et al, 2016). Furthermore, UNESCO (2022) reported that while a small number of students excel in mathematics across all levels of education, the majority find it challenging and often fail. Several factors have contributed to this persistent underperformance, including inadequate mathematics instruction in schools (Uka & Ezeh, 2022).

The widespread failure in mathematics is not limited to regular secondary schools; it also affects students enrolled in the Alternative Secondary Education Pathway (ASEP). ASEP is a programme implemented by Tanzania's Ministry of Education, Science and Technology (MoEST) as part of the Secondary Education Quality Improvement Project (SEQUIP). Although ASEP is currently recognized under this name, it is not a new initiative in Tanzania. It originated in the early 1970s under the programme formerly known as *Elimu kwa Njia ya Posta*, which was managed by the Institute of Adult Education (IAE) under the Ministry of Education and Culture (MoEC) as part of the government's broader strategy to provide education for all. In the 1990s, the programme was renamed *Elimu kwa Njia ya Masafa*, and all public primary and secondary schools across the country were instructed to support its implementation. The primary goal of ASEP is to enhance the quality of secondary education through alternative delivery methods (URT, 2023). Mathematics is one of the core subjects offered through SEQUIP–ASEP, yet it remains one of the most challenging for students, consistently recording high failure rates.

Literature indicates that the teacher–student interactive method is the most effective approach to teaching, followed by student-centred methods, while the teacher-centred approach is considered the least effective. Ayeni (2011) emphasizes that teaching involves facilitating meaningful changes in learners through the use of appropriate instructional strategies. Similarly, Adunola (2011) asserts that to achieve desirable learning outcomes, educators must employ teaching methods that are well-suited to the subject matter. Research findings have shown that the implementation of differentiated instruction significantly enhances students' academic performance. It is therefore recommended that mathematics teachers and other educational stakeholders familiarize themselves with contemporary theories and methodologies related to differentiated instruction in mathematics education.

According to URT (2024), students' performance in Mathematics within the Alternative Secondary Education Pathway (ASEP) remains poor. Kikomelo (2025) reported that out of the 136,481 students who sat for the Certificate of Secondary Education Examination (CSEE) Mathematics paper in 2022, the pass rate remained below 21%, while the failure rate consistently exceeded 78%. The author recommended regular in-service training for Mathematics teachers, particularly in pedagogical practices. Over time, various teaching methods have been introduced and emphasized to improve the effectiveness of Mathematics instruction and enhance student performance. However, limited research exists on the relationship between teaching methods and the academic performance of Stage II students in Mathematics under the ASEP programme. Therefore, it is essential to conduct this study. Table 1 provides an analysis of Stage II ASEP students' performance in Mathematics, based on data from Mbozi and Momba Districts in the Songwe Region.

Table 1: Mathematics Performance of Stage II Students in Mbozi and Momba Districts from 2022 to 2024

Centre	Students' Performance								
	2022			2023			2024		
	Sat	Pass	%	Sat	Pass	%	Sat	Pass	%
Tunduma	14	2	14	18	3	17	26	4	15
Momba	-	-	-	-	-	-	7	0	0
Mkomba	-	-	-	7	0	0	0	0	0
Nalyelye	-	-	-	-	-	-	9	1	11
New Old Vwawa	-	-	-	33	3	9	36	5	14
Mbozi Club	11	1	9	18	2	11	16	0	0
Nyerere	-	-	-	4	1	25	6	0	0

Source: Songwe RRT's Office; March 2025

Table 1 illustrates that only one centre, with 11 students, sat for the Mathematics examination, and only one student passed. In 2023, just 9 out of 73 students who sat for the examination passed. In 2024, only 13 out of 87 students passed. These figures reflect consistently low performance in Mathematics among ASEP students.

Given the significant failure rates revealed, this study aims to evaluate the impact of teaching methods used by ASEP teachers on students' academic performance in Mathematics. According to Kerrigan (2018), student performance in Mathematics can be improved through instructional methods that actively engage learners in the lesson. Goldsmith and Mark (2021) emphasize that active learning involves students interacting with course content beyond traditional lectures—through writing, simulations, applets, games, and other participatory techniques. Mathematics is often taught using conventional approaches, which may contribute to the persistently low performance observed among students.

Research indicates that challenges related to teaching methods are among the key difficulties students face when learning mathematics. According to Abuhasanein et al. (2025), issues such as limited emphasis on modern teaching approaches in teacher training programmes and a lack of focus on innovative instructional strategies contribute to these challenges. Many students find it difficult to engage with Mathematics due to teaching practices that prioritize memorization and repetitive exercises rather than fostering conceptual understanding. This traditional approach can lead to a sense of disconnection from the subject, resulting in decreased motivation and engagement. Furthermore, students often struggle to see

the practical relevance of mathematics in everyday life, which can further reduce their interest and persistence in learning the subject (Boaler, 2016).

Social Cognitive Theory (SCT) is employed in this study to address challenges related to teachers' innovativeness in applying teaching methods. SCT has been extensively utilized across various disciplines, especially in the field of education (Zobai et al., 2021). The theory examines the factors that influence individual behaviour. As Bandura (2001) explains, behaviour is shaped by two main categories of factors: internal and environmental. Internal factors relate to personal engagement, which is linked to innovative practices, while environmental factors include social influences and the conditions that support or hinder behaviour. Drawing on SCT, this study categorizes environmental factors into two groups—facilitating conditions and social influences—and explores how these aspects of teaching methods impact students' performance in mathematics.

Research in the literature highlights that teaching methods that promote active learning are crucial for effective Mathematics instruction. According to Lessani, Yunus, and Bakari (2017), there are three primary teaching approaches: traditional, problem-solving, and discovery learning. Discovery learning involves the teacher acting as a facilitator, guiding students through a variety of activities that encourage them to uncover and construct knowledge independently. Voskoglou (2023) further emphasizes that in the United States, learning occurs when individuals engage socially—discussing and collaborating on shared problems or interests. A similar perspective is presented by Lister, Macdonald, and Shumway (2020), who note that active learning in Mathematics classrooms involves meaningful activities that foster reasoning, critical thinking, and active engagement with mathematical concepts. They advocate for Mathematics teachers to incorporate active learning strategies into their instruction.

Larkana (2025) reported a significant positive impact of group work on students' academic performance, demonstrated by higher average scores in understanding mathematical concepts and problem-solving skills. Similarly, Behlol, Akbar, and Sehrish (2018) found that in India, students taught using the Problem-Solving Approach (PSA) achieved significantly better results compared to those taught through traditional teaching methods. They attributed this improved performance to students' active participation and engagement in self-directed learning.

In Africa, research underscores the effectiveness and critical importance of active learning strategies, student-centred teaching approaches, the integration of ICT, and teacher training as key foundations for enhancing students' performance in

Mathematics. For example, Michael et al. (2023) found that active learning methods play a significant role in mathematics education in Ethiopia. However, they also noted that many teachers lack a clear understanding of how to implement these methods effectively. Similarly, Mbedule (2020) reported that student-centred teaching and learning approaches in secondary school basic mathematics in Tanzania lead to improved academic performance. On the other hand, Mzomwe (2025) revealed that while active learning methods are particularly beneficial for low-achieving students, they have a lesser impact on medium and high achievers.

Most of the existing literature highlights the importance of teaching methods that promote active, interactive, collaborative, and discovery-based learning. However, there is limited information on how these methods specifically impact students' performance in mathematics within the ASEP programme. This gap prompted the current study, which aims to evaluate the effects of teaching methods on the performance of ASEP Stage II students in Mathematics during the years 2023 and 2024. The findings of this study will guide ASEP mathematics teachers in selecting appropriate instructional strategies. Additionally, educational authorities ranging from national to centre levels will be able to identify the training needs of ASEP teachers by comparing the required teaching methods with the teachers' current skill levels. This will enable the provision of targeted professional development to enhance students' performance in Mathematics.

Methodology

This study adopted a mixed-methods approach, integrating both exploratory and descriptive research designs to ensure a comprehensive understanding of the research problem. The combination of qualitative and quantitative techniques facilitated triangulation, thereby enhancing the depth and reliability of the findings. The research was conducted in Mbozi and Momba Districts within the Songwe Region, selected due to consistently low student performance in Mathematics in the ASEP Stage II national examinations over the past three years (2022–2024). The target population comprised 156 individuals, from which a sample of 40 participants was drawn. Three ASEP centres—Tunduma, New Old Vwawa, and Mbozi Club were selected purposively based on their students' academic performance in Mathematics during the specified period. The sample included:

i) 1 ASEP Centre Coordinator;

ii) 1 ASEP Centre Manager;

iii) 8 ASEP Mathematics Teachers; and

iv) 30 ASEP Students (9 from Tunduma, 11 from New Old Vwawa, and 8 from Mbozi Club).

Purposive sampling was employed to select the centre coordinators and managers, as their administrative roles positioned them to provide relevant insights into teaching practices and institutional support. A simple random sampling technique was used to select mathematics teachers, ensuring representativeness and minimizing selection bias. For student participants, quota sampling was applied to achieve gender balance and ensure demographic representativeness.

Data were collected using a combination of:

i) Semi-structured interviews **(**for coordinators and teachers);

ii) Structured questionnaires (for teachers and students); and

iii) Non-participant observation (to capture authentic classroom practices).

Interviews enabled an in-depth exploration of participants' perspectives on mathematics teaching methods and their perceived impact on student performance. Questionnaires were designed to ensure anonymity and confidentiality, encouraging honest responses. Observational data provided contextual insights into actual teaching practices within ASEP centres. To ensure content validity, all instruments were carefully constructed with clear and concise questions aligned with the study's objectives. A combination of closed-ended and open-ended items was included to capture both quantitative metrics and qualitative insights**.** Reliability was assessed using the test-retest method**,** with correlation analysis conducted to evaluate consistency over time. Qualitative data from interviews were analyzed thematically, guided by predefined coding schemes that reflected the study's conceptual framework. Quantitative data from questionnaires were tabulated and manually analyzed using Microsoft Excel, allowing for descriptive statistical interpretation. Ethical integrity was maintained throughout the study. Participants were fully informed of the purpose and objectives of the research and were invited to participate voluntarily**.** Informed consent was obtained, and participants were assured of the confidentiality and anonymity of their responses.

Results and Discussion

There was a need to examine methods used by the ASEP teachers in teaching Mathematics so as to determine their effectiveness towards students' performance in the subject. The Likert scale with a list of methods was given to teachers and

instructed to rate the frequency of use of each method. Teachers' responses were as presented in Table 2.

Table 2: The Frequency with which Teachers use the following Facilitation Methods

Methods	Responses (∑n=8)									
	1		2		3		4		5	
	f	%	f	%	f	%	f	%	f	%
Brainstorming	3	37.5	3	37.5	2	25	0	0	0	0
Experiments	7	87.5	1	12.5	0	0	0	0	0	0
Games	4	50	2	25	2	25	0	0	0	0
Demonstration	1	12.5	0	0	2	25	3	37.5	2	25
Group work	1	12.5	2	25	2	25	2	25	1	12.5
Projects	1	12.5	1	12.5	4	50	1	12.5	1	12.5
Problem solving	1	12.5	3	37.5	2	25	1	12.5	1	12.5
Questions and answers	0	0	0	0	3	37.5	2	25	3	37.5

Source: Researcher; January, 2025

Note: Key: Never 2. Not often 3. Fairly Often 4. Often 5. Very often

Based on the data presented in Table 2, it is evident that most teachers rarely use active learning methods such as brainstorming, experiments, and games. Specifically, 37.5% of teachers reported never using brainstorming, 87.5% never use experiments, and 50% never use games. Additionally, 37% of teachers indicated that they do not often use brainstorming and problem-solving strategies. These findings suggest that many teachers do not employ instructional methods that actively engage students during mathematics lessons. This lack of active learning may contribute to the low performance in Mathematics among ASEP students. As recommended by Lister, Macdonald, and Shumway (2020), mathematics teachers should incorporate active learning techniques such as brainstorming, experiments, problem-solving, and games to enhance student engagement and achievement. Furthermore, the data imply that while these methods are effective in improving students' performance in Mathematics, they are underutilized by most teachers. This aligns with Kerrigan (2018), who emphasized that students' mathematics performance can be improved through active participation in the learning process.

Table 3: Methods that help Students understand Mathematics more easily

Methods	Responses (∑n=8)									
	1		2		3		4		5	
	f	%	f	%	f	%	f	%	f	%
Brainstorming	0	0	1	3	3	10	10	33	16	53
Experiments	0	0	2	7	5	17	11	37	12	40
Games	0	0	0	0	6	20	11	37	13	43
Lecturing	15	50	13	43	2	7	0	0	0	0
Projects	3	10	3	10	7	23	10	33	10	33
Problem solving	1	3	2	7	0	0	10	33	17	57
Questions and Answers	7	23	8	27	6	20	5	17	4	13

Source: Researcher; January, 2025

Note: Key: 1. Very low 2. Low 3. Fairly low 4. High 5. Very high

According to the data presented in Table 3**,** the majority of students demonstrated a high level of understanding in Mathematics when taught using active learning methods. Specifically, 57% of students responded positively to problem-solving, 53% to brainstorming, 43% to games, and 40% to experiments. This suggests that problem-solving, brainstorming, games, and experiments significantly enhance students' comprehension of Mathematics and contribute to improved academic performance. These methods are highly effective because they actively engage learners in the learning process. The findings align with the study by Vale and Barbosa (2023), which emphasizes that learning is an active endeavor. Teaching strategies that promote active participation are essential for fostering critical thinking and achieving strong academic outcomes.

Additionally, data were collected to determine whether teachers possess the skills to use various teaching methods particularly those that are effective in creating an active classroom environment**.** Using a Likert scale, ASEP teachers were asked to rate their level of proficiency in a range of instructional methods. Their responses are summarized in Table 4.

Table 4: The Level of Teachers' Proficiency in applying the following Facilitation Methods

Methods	Responses (∑n=8)									
	1		2		3		4		5	
	f	%	f	%	f	%	f	%	f	%
Brainstorming	3	37.5	2	25	2	25	1	12.5	0	0
Experiments	4	50	2	25	1	12.5	1	12.5	0	0
Games	2	25	3	37.5	1	12.5	1	12.5	1	12.5
Lecturing	0	0	0	0	4	50	2	25	2	25
Projects	1	12.5	1	12.5	3	37.5	3	37.5	0	0
Problem solving	2	25	2	25	3	37.5	1	12.5	1	12.5
Questions and Answers	0	0	0	0	1	12.5	3	37.5	4	50

Source: Researcher; January, 2025

Note: Key: 1. Very low 2. Low 3. Fairly low 4. High 5. Very high

The data presented in Table 4 indicate that a majority of teachers have very low skill levels in using certain instructional methods: experiments (4 teachers, 50%), brainstorming (3 teachers, 37.5%), games (2 teachers, 25%), and problem-solving (2 teachers, 25%). The table also shows that many teachers are rated as having low skill levels in using games (3 teachers, 37.5%), experiments (2 teachers, 25%), brainstorming (2 teachers, 25%), and problem-solving (2 teachers, 25%). These findings suggest that most teachers lack proficiency in employing key instructional strategies in mathematics education—specifically, experiments and games.

Table 5: The Level of Students' Engagement in Lessons facilitated by the following Instructional Methods

Methods	Responses (∑n=30)									
	1		2		3		4		5	
	f	%	f	%	f	%	f	%	f	%
Brainstorming	14	47	7	23	6	20	2	7	1	3
Experiments	19	63	11	37	0	3	0	3	0	3
Games	14	47	12	40	3	10	1	3	10	33
Lecturing	1	3	1	3	2	7	10	33	16	53
Projects	3	10	3	10	3	10	11	37	10	33
Problem solving	15	50	12	40	3	10	1	3	1	3
Questions and Answers	0	3	0	3	1	3	13	43	16	53

Source: Researcher; January, 2025

Note: Key: 1. Not at all 2. Somehow 3. Neutral 4. Greatly 5. Very greatly

The data presented in Table 5 indicate that the majority of students are not actively engaged in instructional methods such as experiments (19 students, 63%), followed by problem-solving (15 students, 50%), brainstorming (14 students, 47%), and educational games (14 students, 47%). These findings suggest that most students are not being engaged through active teaching strategies that could otherwise be employed by their teachers. This lack of engagement negatively impacts their performance in Mathematics. These results align with Voskoglou (2023), who found that in U.S. schools, mathematics learning is most effective when students engage socially—discussing and collaborating on shared problems or interests. The findings are further supported by observational data, which revealed that teachers predominantly relied on question-and-answer techniques. While common, this approach does little to foster active learning or promote the critical thinking skills essential for mathematical success. Consequently, student performance in Mathematics is adversely affected.

Interviews with teachers regarding effective methods for teaching Mathematics revealed the following insights:

> In my view, the most effective methods for teaching mathematics are those that actively engage students in the lesson. They foster participation, which is essential for enhancing memory and application of mathematical concepts. Some of these methods include problem-solving, brainstorming, and experiments. (Interview with Centre Coordinator, March 2025).

Another ASEP teacher stated:

> There are participatory and non-participatory methods in teaching. However, for mathematics instruction, I recommend participatory methods—especially those that promote critical thinking and reasoning, such as experiments, brainstorming, group work, and problem-solving. (Interview with Centre Coordinator, March 2025).

These responses suggest that teachers advocate for instructional strategies that actively involve students in the learning process. Methods such as brainstorming, experiments, group work, and problem-solving are seen as effective in promoting critical thinking, enhancing memory, and improving students' understanding and performance in mathematics.

Centre coordinators were also interviewed to assess whether teachers were employing engaging methods in mathematics instruction. Their responses revealed concerns:

> We occasionally evaluate how teachers apply instructional methods. Unfortunately, the methods currently used are not particularly engaging and

> therefore not effective in enhancing the teaching and learning of Mathematics. For instance, the most commonly used methods are question-and-answer sessions and group work. (Interview with Centre Coordinator, March 2025).

Another coordinator added:

> Yes, teachers do use these methods, but only rarely. Moreover, the methods employed are not the ones considered most effective for mathematics instruction. Techniques such as problem-solving, experiments, brainstorming, and project-based learning are seldom used, despite their proven effectiveness in teaching Mathematics. (Interview with Centre Coordinator, March 2025).

These findings highlight a disconnect between teachers' understanding of effective pedagogical approaches and their actual classroom practices. While active learning methods are acknowledged as beneficial, their limited implementation may hinder students' mathematical development and overall academic performance.

The findings indicate that although teachers employ instructional methods in Mathematics, the strategies used are generally unengaging and fail to foster students' critical thinking. This suggests that teachers may lack competence in implementing active teaching approaches. As a result, widespread underachievement in Mathematics could be linked to the ineffective use of appropriate pedagogical methods. These findings align with those of Lessani, Yunus, and Bakar (2017), who found that students often experience mathematics anxiety due to the teaching methods applied in classrooms, which in turn contributes to poor performance in the subject. Additionally, observational data collected by the researcher show that most teachers rely primarily on group work and question-and-answer techniques, methods that, while familiar, do not sufficiently promote active learning or critical engagement.

Conclusion and Recommendations

Based on the findings of this study, it can be concluded that most mathematics teachers do not utilize effective active teaching methods, such as projects, experiments, games, problem-solving, and brainstorming, that are essential for fostering critical thinking among learners. Instead, they frequently rely on less engaging strategies such as question-and-answer sessions, demonstrations, and group work. These methods, while commonly used, are less effective in actively involving students in the learning process and may therefore hinder their performance in Mathematics. Additionally, the study reveals that while many teachers demonstrate strong proficiency in traditional methods like lecturing and question-and-answer techniques, they possess limited skills in implementing more

interactive approaches such as brainstorming and problem-solving. These latter methods are identified in this paper as highly effective for mathematics instruction. As a result, the academic performance of ASEP students in Mathematics is adversely affected.

Moreover, both teachers and students recognize methods like problem-solving, brainstorming, projects, and experiments as effective for teaching mathematics. However, these approaches are rarely applied in practice, further contributing to students' underperformance. The study also highlights that ASEP students are generally less engaged during lessons. This lack of active participation negatively impacts their understanding, as active involvement is crucial for deep learning particularly in Mathematics.

Based on the findings and conclusions of this research, the study recommends the following:

i) It is essential for the management of the Institute of Adult Education (IAE) to develop a structured training framework aimed at equipping ASEP teachers with effective, modern methods for teaching and learning Mathematics. This professional development initiative should emphasize the importance of active instructional strategies that foster critical thinking and student engagement.

ii) ASEP teachers should cultivate a commitment to continuous learning and professional growth, particularly in the application of diverse mathematics teaching methods. Approaches such as problem-solving, brainstorming, project-based learning, and experimentation should be prioritized for their proven effectiveness in enhancing student understanding and performance. Teachers are also encouraged to demonstrate professional integrity by consistently applying appropriate and effective teaching methods, even under minimal supervision and assessment. By doing so, they can contribute meaningfully to improving the quality of mathematics education and student outcomes within the ASEP programme.

References

Abuhasanein, Y., Rejeb, A., & Jemai, K. (2025). Challenges to learning mathematical concepts among sixth-grade students in primary education: A teachers' perspective. *International Electronic Journal of Mathematics Education, 20* (2).

Bandura, A. (2001). *Social cognitive theory: An agentic perspective. Annual Review of Psychology 52* (1).

Behlol, M., Akbar, R., & Sehrish, H. (2018). Effectiveness of Problem-Solving Method in Teaching Mathematics at the Elementary Level. *Bulletin of Education and Research, 40* (1), 231 - 244.

Cardino Jr., J.M., & Ortega-Dela Cruz, R.A. (2020). Understanding of learning styles and teaching strategies towards improving the teaching and learning of mathematics. LUMAT: *International Journal on Math, Science and Technology Education, 8* (1), 19 - 43.

Effect of Group Work on Students' Performance in Mathematics at the Elementary Level in District Larkana. (2025). *The Critical Review of Social Sciences Studies, 3* (1), 631- 641.

Gravemeijer, K., Stephan, M., Julie, C. *et al.* (2017). What Mathematics education may prepare students for the society of the future? *Int Journal of Science and Mathematics Education 15.* 105 - 123.

Kerrigan, J. (2018). *Active Learning Strategies for the Mathematics Classroom, 2* (66), p. 36.

Kikomelo (2024). Students' Perceptions of Mathematics Teachers' Implementation of Problem-based Learning Practices in Tanzania. *Journal of Advanced Academics.*

Larkana. (2025). Effect of grouwork on students' performance in Mathematics at the llementary level in District. *The Critical Review of Social Sciences Studies*, *3* (1), 631- 641.

Lessani A., Yunus, A., & Bakar, K. (2017). Comparison of new mathematics teaching methods with traditional method. *International Journal of Social Sciences, 3* (2), 1285 – 1297.

Lister, K., Macdonald, B. & Shumway, J. (2020). *The Mathematics enthusiast, 17* (2), 615 – 640.

Lugosi, E. & Uribe, G. (2022). Active learning strategies with positive effects on students' achievements in undergraduate mathematics education. *International Journal of Mathematical Education in Science and Technology, 53* (2), 403 - 424.

Mangwende, E., & Maharaj, A. (2018). Secondary school Mathematics teachers' use of students' learning styles when teaching functions: A case of Zimbabwean schools. *Eurasia Journal of Mathematics, Science and Technology Education, 14* (7), 3225-3233.

Mazana, M., Montero, C., Casmir, R., (2020). Assessing students' performance in Mathematics in Tanzania: The teacher's perspective. *International Electronic Journal of Mathematics Education, 15* (3).

Mazana (2025) The Effect of Teaching Approaches on Students' Academic Achievement in Mathematics at the Higher Education Level. *International Journal for Mathematics Teaching and Learning, 25* (1), pp 1-17.

Mbedule, N. (2020). *The Influence of Teaching Methods on Students' Academic Performance in Secondary School Basic Mathematics*. Dar es Salaam, Tanzania. The Open University of Tanzania.

Michael, K. Alemu, M. Desie, Y. Atnafu, M. Assefa, S. (2023). Understanding and practice of active learning among upper primary school science and Mathematics teachers. *Heliyon 9* (6).

Muema, J. (2023). Relationship Between Teaching Method and Students' Performance in Mathematics in Public Secondary Schools in Dadaab Sub-County, Garissa County, Kenya. *IOSR Journal of Research & Method in Education (IOSR-JRME), 8* (5), 59 - 63.

Razia, N and Khan, R. (2019). Activity-based teaching versus traditional method of teaching in Mathematics at the elementatry Level. *BullFetin of Education and Research, 41* (2). p145 -159.

Sunzuma, Chando, Gwizangwe, Zezekwa & Zinyeka (2020). In-service Zimbabwean teachers' views on the utility value of diagrams in the teaching and learning of geometry. *International Journal on Math, Science and Technology Education, 8* (1), 1-18.

Umugiraneza, O., Bensilal, S. & North, D. (2017). Exploring teachers' practices in teaching mathematics and statistics in KwaZulu-Natal schools. *South African Journal of Education, 37* (2).

Vale, I. & Barbosa, A. (2023). Active learning strategies for effective Mathematics teaching and learning. *European Journal of Science and Mathematics Education, 11* (3), 573 – 588.

Voskoglou, M. (2019). Comparing teaching methods of Mathematics at the university level. *Education Sciences, 9* (3*)*, 204-.

Zobair, K. M., Sanzogni, L., Houghton, L. & Islam, M. Z. (2021). *Forecasting care seekers' satisfaction with telemedicine using machine learning and structural equation modeling*. PloS one https://doi.org/10.1371/journal.pone.0257300.