Relationship Between Use of Gender Transformative Pedagogies and Mathematics Instruction in Public Secondary Schools in Lower Eastern Region, Kenya.

Benedict Maluni, Dr. Peter Kimanthi Mbaka (PhD) and Dr. John Otieno Ogembo (PhD)
bmaluni @chuka.ac.ke, pkimanthi@chuka.ac.ke and jogembo@chuka.ac.ke

Abstract

The purpose of this study was to determine the relationship between the use of gender transformative pedagogies and Mathematics instruction in public secondary schools in the Lower Eastern region of Kenya. The study adopted descriptive survey and correlational research designs. The target population consisted of 108,705 respondents, including 105,764 Form Three students, 1,763 Mathematics teachers, 1,175 Heads of Mathematics Subject, and 3 County Quality Assurance and Standards Officers drawn from Machakos, Makueni and Kitui Counties. A sample size of 399 respondents was selected through multistage sampling, comprising stratified, purposive and simple random sampling techniques. Pilot testing was conducted within the study area and the instruments yielded a Cronbach's alpha coefficient above 0.70, confirming reliability. Data were collected using questionnaires and interview schedules and analyzed using both descriptive and inferential statistics with the aid of SPSS version 30.0. Hypotheses were tested at $\alpha = 0.05$ using binary logistic regression analysis. The findings established that the use of gender transformative pedagogies had a positive and significant relationship with Mathematics instruction in public secondary schools. The study concluded that the integration of gender transformative pedagogies enhanced engagement, participation and achievement in Mathematics instruction by promoting inclusive and equitable classroom practices. The study therefore recommends a concerted effort in implementation of GTPs especially in low performing schools where GTPs are minimally used in Mathematics instruction considering that the GTPs have the potential to significantly enhance Mathematics instruction and expected learning outcomes.

Keywords: Gender transformative pedagogies, Mathematics instruction, Gender responsive learning techniques, Gender responsive feedback and assessment activities, Gender responsive curriculum designs

1. Introduction

Gender transformative pedagogies (GTPs) have become a powerful tool in addressing gender imbalances in education, particularly in STEM subjects like Mathematics. These approaches go beyond simply recognizing gender differences; they actively challenge and reshape the societal norms and biases that contribute to gender inequalities in the classroom. The aim of GTPs is to create a learning environment where all students regardless of gender, have equal opportunities to succeed, free from the constraints of traditional gender expectations. Abdullah, Idrus, Gao, &

Muhammad (2024) highlight that in Mathematics, GTPs seek to break down the stereotype of the subject being male-dominated by encouraging more girls to participate and addressing the challenges they face in engaging with the material. The goal is to dismantle social barriers that hinder girls' success in Mathematics, ensuring they are equally supported in their academic journeys.

Gender disparities in Mathematics achievement are influenced by various social and cultural factors. Stereotypes and biases often shape students' confidence and interest in the subject, with societal beliefs, teacher attitudes, and the lack of female role models in STEM all playing significant roles. Guiso, Monte, Sapienza and Zingales (2021) found that these perceptions often result in girls receiving less encouragement and support in Mathematics classrooms, which undermines their confidence and engagement. Societal stereotypes, like the idea that boys are inherently better at Mathematics than girls, affect both teacher expectations and students' self-perception. Fryer & Levitt (2020) argue that such stereotypes can influence classroom dynamics, reinforcing traditional gender roles and discouraging girls from fully participating in or pursuing Mathematics. GTPs aim to challenge these biases by creating an environment where all students, regardless of gender, are encouraged to excel in the subject.

A central feature of GTPs in Mathematics instruction is the use of inclusive teaching strategies that actively involve both boys and girls in the learning process. Research has shown that methods like collaborative learning, problem-based learning, and peer-assisted learning are especially effective in breaking down gender barriers. Ala, Yang, and Ala (2021) found that in collaborative learning environments, students work together to solve problems, share ideas, and challenge each other's thinking. This not only promotes critical thinking and problem-solving skills but also fosters a sense of equality in the classroom, where all students can contribute equally, regardless of gender. Such approaches create opportunities for students to challenge traditional gender roles and encourage boys and girls to work together as equals. This helps build a more inclusive and supportive classroom dynamic, which is essential for achieving the objectives of GTPs.

Curriculum and content design are also vital in making GTPs effective. Stout, Dasgupta, Hunsinger and McManus (2021) emphasize that including diverse role models and perspectives in the Mathematics curriculum is crucial in challenging the stereotype of the field being male-dominated. By incorporating female mathematicians and scientists into teaching materials and highlighting women's contributions to Mathematics, educators can provide female students with relatable role models. These role models demonstrate that success in Mathematics is within reach for all students, regardless of gender. Additionally, using gender-neutral language in textbooks and instructional resources helps avoid reinforcing traditional gender roles. Tiwari (2024) argues that inclusive language ensures that all students, regardless of gender, see themselves as capable of succeeding in Mathematics. By making these adjustments to the curriculum, GTPs create a more equitable and accessible learning environment.

Assessment practices are another critical component of GTPs. Studies have shown that gender-neutral assessment methods, those that focus on individual student performance rather than their gender, are key to promoting fairness in the classroom (Vijayan, 2024). Gender-neutral assessments help ensure that both boys and girls have equal opportunities to demonstrate their mathematical abilities. According to Boaler (2016), formative assessments, such as quizzes, assignments, and peer evaluations, are especially effective in Mathematics classrooms. They provide regular feedback, allowing teachers to identify and address learning gaps early, which improves students' understanding of the material and boosts their confidence. These assessments help students see that their efforts are recognized, further promoting a positive and inclusive learning environment.

Research shows that implementing GTPs can positively influence both students' performance and their attitudes toward Mathematics. In a study by Hernandez and Cudiamat (2018), schools that adopted gender-sensitive teaching methods saw a significant increase in female students' participation and achievement in Mathematics. Female students in these schools reported feeling more confident in their mathematical abilities, which led to higher levels of engagement and achievement. These findings suggest that creating a gender-equitable classroom environment can help close the gender gap in Mathematics and encourage more girls to pursue Mathematics in higher education.

Globally, numerous studies have examined the integration of gender-transformative pedagogies, with mixed results. In the United States, Carr and Hsu (2022) found that gender-responsive teaching strategies in middle school Mathematics classrooms increased female students' participation and improved their performance. Their research underscored the importance of teacher training in gender equity. In Australia, Clarke and Gunter (2021) explored gender-transformative practices in STEM education across various schools. Their study showed that adopting these practices led to a noticeable shift in student attitudes toward Mathematics, with increased engagement and achievement among female students. Similarly, in the Philippines, Hernandez and Cudiamat (2018) observed that gender-sensitive instructional methods helped create a more inclusive classroom, boosting both male and female students' participation and performance. However, a study by Sanders and Lee (2020), which analyzed data from several countries, found that while gender-transformative pedagogies generally improved students' attitudes toward Mathematics, they did not significantly reduce gender performance gaps. This suggests that these pedagogies may need to be combined with broader systemic changes to fully address gender disparities in Mathematics achievement. The mixed results of these global studies highlight the need for more research into the specific contexts and factors that make gender-transformative pedagogies most effective.

In Africa, several studies have shown the positive impact of gender-transformative pedagogies. In Malawi, Mafuleka (2023) found that integrating gender-sensitive teaching methods into pre-service teacher training helped narrow the gender gap in STEM subjects. In Ghana, Agyei (2021) reported that gender-responsive strategies in secondary schools led to improved female students' confidence

and participation in Mathematics. In Nigeria, Okafor and Adewumi (2022) discovered that gender-transformative teaching approaches significantly boosted girls' performance in Mathematics, challenging long-standing gender stereotypes. In South Africa, Van der Merwe and Botha (2024) observed that rural schools that adopted gender-transformative pedagogies saw improvements in both boys' and girls' performance in Mathematics, which they attributed to more inclusive teaching practices. However, a study from Morocco by El Fassi (2024) found no significant difference in Mathematics achievement between girls and boys after implementing gender-transformative strategies. This suggests that while gender-sensitive teaching methods may affect student engagement and confidence, they do not always lead to better learning outcomes, pointing to the need for further research into the factors that may influence their effectiveness.

In East Africa, several studies have explored the impact of gender-responsive pedagogy. Mukagiahana et al. (2024) found that gender-sensitive teacher training interventions in Rwanda led to significant improvements in female students' participation and performance in STEM subjects. In the Democratic Republic of Congo, Gándara and Laesecke (2022) found that schools with female teachers who practiced gender-responsive methods had higher rates of female student participation and achievement. Tanzania has also made strides in addressing gender gaps in Mathematics, a research by Thabiti, Mwandilawa and Basela (2023) revealing that female students performed better in Mathematics when teachers used gender-transformative strategies. A follow-up study by the same authors revealed that teachers who had undergone gender-responsive training saw improvements in classroom dynamics and student engagement. However, a study in Uganda by Mukisa and Bwanika (2022) found no significant differences in Mathematics achievement between boys and girls after gender-responsive pedagogies were implemented. This suggests that factors like socio-economic status or prior academic exposure may also play a significant role in the success of these interventions, emphasizing the need for broader research into the dynamics of gender-transformative pedagogy across different contexts.

In Kenya, the interest in gender-responsive teaching methods in Mathematics has been growing. Mutua and Ochieng (2022) found that when teachers in rural secondary schools applied gender-transformative approaches, female students showed significant improvement in their Mathematics performance. Njoroge, Mutuku and Otieno (2021) reported that schools where teachers had received gender-transformative training saw better overall Mathematics performance, particularly among female students. Furthermore, Mwangi, Wairimu and Muriithi (2022) compared gender-responsive student-centered teaching methods with traditional, teacher-centered approaches and found that the former led to improved outcomes for girls. However, a study by Chege and Kimani (2023) in Western Kenya found no significant difference in Mathematics achievement between students taught using gender-responsive methods and those taught through traditional methods. These mixed findings raise questions about the consistency of gender-transformative pedagogies' effectiveness across different regions and socio-economic contexts in Kenya, highlighting the need for more research into how these strategies work in diverse settings.

2. Theoretical Framework

The study adopted the Social Constructivism Theory, developed by Soviet psychologist Lev Vygotsky, which emphasizes the social nature of learning and the importance of culture and social interaction in cognitive development. Vygotsky's groundbreaking ideas, particularly the concepts of the zone of proximal development (ZPD) and scaffolding, have had a profound influence on educational practices, particularly in areas like Mathematics education (Vygotsky, 1978). His work has been further developed by scholars like Jerome Bruner, who continued to explore the significance of social contexts in learning. Social constructivism posits that knowledge is actively constructed by individuals through their interactions with others and their environment, rather than being passively absorbed. Learning, therefore, is inherently social and happens through collaborative engagement, communication, and problem-solving.

Vygotsky argued that cognitive development is deeply tied to social interaction, with cultural tools like language, symbols, and practices shaping how we think. He believed that learners do not develop in isolation; instead, their learning is shaped by the cultural, social, and historical context in which they live. A key element of his theory is the zone of proximal development (ZPD), which suggests that students learn best when they are guided by more knowledgeable others, whether that's a teacher, a peer, or a mentor, on tasks that are just beyond their current abilities. This process of scaffolding, where more experienced individuals provide support to help learners master new concepts, enables students to eventually perform tasks independently.

In addition, Vygotsky introduced the idea of dialogic learning, where learning happens through dialogue and interaction. This allows learners to co-construct knowledge in a social setting (Vygotsky, 1978). While social constructivism has significantly shaped educational theory, it has also faced some critiques. One common criticism is that it can overlook the individual nature of learning. By focusing so heavily on social interaction, critics argue that social constructivism neglects the internal cognitive processes that are also crucial for learning (Schoenfeld, 2016). Some also argue that social constructivism does not fully account for unequal power dynamics in classrooms, where students with different backgrounds and levels of prior knowledge may not have equal opportunities to engage in collaborative learning activities. Another critique of social constructivism is that it assumes all students have access to the necessary social and cognitive tools to engage meaningfully in collaboration. In reality, factors like language barriers, socioeconomic status, and cultural differences can limit some students' ability to fully participate in collaborative learning activities, potentially leading to unequal learning opportunities (Schoenfeld, 2016). Finally, while social constructivism emphasizes the importance of collaboration, there is concern that it may not provide enough structure for students who need more direct, explicit instruction to master foundational knowledge, especially in subjects like Mathematics, which often require a deep understanding of specific concepts before progressing to more complex topics (Boaler, 2016).

In Mathematics education, social constructivism highlights the importance of creating learning environments where students engage in discussions, work together to solve problems, and support each other's learning. Through these social interactions, students not only learn mathematical content but also internalize mathematical reasoning processes. For example, in cooperative learning groups within Mathematics classrooms, students work together to solve problems and discuss mathematical concepts, deepening their understanding and developing critical thinking skills in the process.

Social constructivism is particularly relevant to the study of gender-transformative pedagogies (GTPs) in Mathematics instruction because it aligns with the idea that learning is most effective when it happens through social interaction and collaboration. GTPs that emphasize cooperative learning, group problem-solving, and peer discussions echo the principles of social constructivism. By creating environments where students of different genders collaborate, share ideas, and work on mathematical tasks together, GTPs offer both boys and girls equal opportunities to engage in the learning process. This approach challenges traditional gendered assumptions about who is "better" at Mathematics. Social constructivism can also explain why collaborative learning strategies in GTPs yield positive outcomes. These strategies encourage dialogic learning, where both boys and girls have equal opportunities to contribute, challenge each other's thinking, and co-create knowledge (Gillies, 2023). By working together, students not only develop a deeper understanding of mathematical concepts but also disrupt the gendered power dynamics that often favor male students in Mathematics classrooms.

The theory also supports scaffolding, where teachers guide students through increasingly challenging mathematical tasks. Through scaffolding, teachers help students build the skills necessary to tackle more complex problems, ensuring that all students regardless of gender, are equally supported in their learning journey. This is particularly important in addressing gender disparities in Mathematics, as girls, who may have internalized societal stereotypes about their mathematical abilities, can receive the encouragement and support needed to succeed.

Lastly, social constructivism underscores the role of the social context in shaping student learning. In classrooms where GTPs are applied, the social context is intentionally reshaped to be more inclusive and equitable. By emphasizing collaboration, equal participation, inclusive learning practices, and diverse role models, GTPs help create an environment where both male and female students feel empowered to engage with Mathematics. This ensures that both genders are equally capable of pursuing higher-level Mathematics without being constrained by traditional gender norms.

2.1 Conceptual Framework

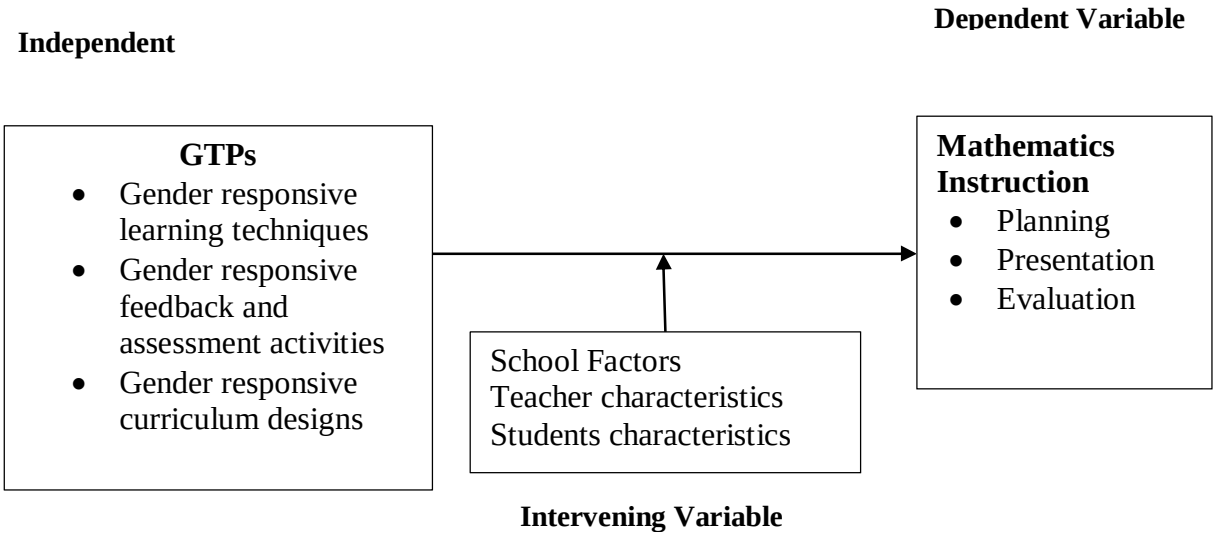

Figure 1: Conceptual Framework illustrating inferential relationship

The conceptual framework presented in this study explores the inferential relationship between gender transformative pedagogies (GTPs) and Mathematics instruction, with teacher characteristics and school factors serving as interveners. The model focuses on how GTPs can be used to foster an equitable and inclusive learning environment for all students, addressing both the descriptive and inferential aspects of how gender dynamics influence the teaching of Mathematics.

3. Methodology

The study adopted correlational research design. The study sample entailed 399 respondents who included 236 form Three students, 80 Mathematics teachers, 80 Mathematics Heads of Subject and 3 CQASOs sampled from a population of 108,705 respondents. Sample size was determined using the Yamane's formula, a widely accepted method for determining sample size in surveys with large populations. Data was collected using questionnaires for form Three students, Mathematics teachers, Mathematics HOS and interview schedule for CQASOs. The study attained a response rate equivalent to 96.74% which according to Babbie and Muoton (2002) exceeded the minimum acceptable threshold for analysis. It means that of the sampled respondents, 386 who included 234 students, 76 Mathematics teachers, 73 Mathematics HOS and 3 County Quality Assurance and Standards Officers from Makueni, Machakos and Kitui counties in Lower Eastern region, Kenya participated in the study. Data obtained was analyzed qualitatively and quantitatively. Qualitative data was analyzed thematically while quantitative data was analyzed using descriptive and inferential statistics with the aid of Statistical Packages for Social Science version 30.0.

3.1 Research Hypothesis

A research hypothesis developed and utilized in the study was;

$H_0$1: There is no statistically significant relationship between use of gender transformative pedagogies and Mathematics instruction in public secondary schools in Lower Eastern region, Kenya.

3.2 Study Variables

The study utilized two variables including Mathematics Instruction and Implementation of GTPs in Mathematics instruction. Both Mathematics instruction variable and Implementation of GTPs variable were each made up of fifteen statements assessed using Likert scaled statements ranging from 1=Strongly Disagree to 5-Strongly Agree. The variables were piloted using 80 respondents, comprising 20% of the total study sample from the study area who were not included in the actual study. This pilot sample was considered adequate according to Connelly (2018) who avers that a pilot sample should contain at least 10% of the study sample. The variables yielded Cronbach reliability index of 0.903, 0.805 and 0.812 (teachers, students and HOS respectively) for Mathematics instruction and, 0.716 and 0.801 (teachers and HOS respectively) for Implementation of GTPs. In the actual study the variables yielded Cronbach reliability index of 0.971, 0.819 and 0.833 (teachers, students and HOS respectively) for Mathematics instruction and, 0.798 and 0.879 (teachers and HOS respectively) for Implementation of GTPs.

Prior to analysis, the variables were subjected to diagnostic tests including normality, collinearity, autocorrelation and heteroscedasticity tests. The normality test was based on Shapiro-Wilk test the variables yielding a statistic of 0.599 (p=0.006) for Mathematics instruction and 0.237 (p=0.073) implying a non-normal distribution for the dependent variable (Mathematics instruction). Collinearity test for the model based on Variance inflation factor (VIF) yielded tolerance value of 0.887 and VIF value of 1.957 indicating linearity for the model. Durbin-Watson test for autocorrelation yielded a d=1.707 indicating absence of autocorrelation. Heteroscedasticity test which was based on Koenker test yielded LM=1.237 (p=0.767) implying homoscedastic model. The non-normal distribution implied non-parametric analysis for the model thus the use of binary logistic regression in establishing the relationship between the variables.

4. Results and Discussion

The study sought to determine the relationship between integration of gender transformative pedagogies and Mathematics instruction in public secondary schools in Lower Eastern region, Kenya. The null hypothesis ($H_0$1) developed to test for the existing relationship stated that; there is no statistically significant relationship between use of gender transformative pedagogies and Mathematics instruction in public secondary schools in Lower Eastern region, Kenya. Binary logistic regression was used to test the hypothesis. Prior to the inferential analysis, descriptive statistics such as frequencies and percentages were used to describe respondents' perception of the

dynamics of Mathematics instruction as well as implementation of the GTPs. Table 1 presents Mathematics teachers' views as regards Mathematics instruction.

Table 1: Mathematics Instruction (Teachers Perspective) N=76

Mathematics instructional process activities	SD	D	N	A	SA	Total
During preparation of Mathematics lesson, I:						
Identify learning objectives	30.3	7.9	5.3	7.9	48.7	100.0
Source for relevant content	23.7	5.3	-	13.2	57.9	100.0
Source for appropriate instructional resources	34.2	-	-	21.1	44.7	100.0
Identify appropriate methods of presentation	34.2	-	-	26.3	39.5	100.0
Select appropriate assessment method	26.3	7.9	-	32.9	32.9	100.0
During presentation, I:						
Continuously engage learners	34.2	5.3	15.8	27.6	17.1	100.0
Guide learners in manipulation of learning materials	34.2	7.9	10.5	25.0	22.4	100.0
Facilitate learners to form groups to undertake activities	48.7	5.3	15.8	6.6	23.7	100.0
Give learners opportunities to ask questions and seek clarification	32.9	7.9	26.3	-	32.9	100.0
To evaluate learning, I:						
Give students adequate exercises for practice	21.1	5.3	34.2	7.9	31.6	100.0
Give assignments which are engaging to respond to	21.1	-	23.7	21.1	34.2	100.0
Provide prompt feedback for assignments	21.1	-	13.2	26.3	39.5	100.0
Facilitate correction of assignments	21.1	-	21.1	18.4	39.5	100.0
Ask questions that require specific answers	14.5	-	18.4	35.5	31.6	100.0
Ask questions that require explanations	13.2	7.9	13.2	32.9	32.9	100.0

Key: 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree

The study findings showed that with regard to lesson preparation, more than half (56.6%) of the sampled Mathematics teachers identified learning objectives, more than two thirds (71.1%) sourced for relevant content, slightly less than this proportion sourced for appropriate instructional resources (65.8%), identified appropriate methods of presentation (65.8%) and selected appropriate assessment methods (65.8%). This implies that close to two thirds of teachers (65.0%) took time to adequately prepare for Mathematics lessons beforehand. During lesson presentation, fewer teachers (44.7%), continuously engaged learners, guided learners in manipulation of learning materials (47.4%), facilitated learners to form groups to undertake activities (30.3%) and gave learners opportunities to ask questions and seek clarification (32.9%). Findings showed that a minority of the teachers sampled (38.8%) adopted learner-centered teaching activities during Mathematics lessons. At the evaluation phase, findings indicated that fewer teachers (39.5%) gave students

adequate exercises for practice, slightly more than half (55.3%) gave assignments which were engaging to respond to, while a more than this proportion provided prompt feedback for assignments (65.8%), facilitated correction of assignments (57.9%), asked questions that required specific answers (67.1%) and asked questions that required explanations (65.8%). Data obtained showed that more than half of the teachers (58.6%) sampled undertook formative evaluation activities to determine the extent to which learning outcomes had been achieved. Findings from Form Three students were as shown in Table 2.

Table 2: Mathematics Instruction (Form Three Students) N=234

Mathematics instructional process activities	SD	D	N	A	SA	Total
During Mathematics lesson, my teacher:						
Continuously engages learners	9.4	0.9	7.3	19.2	63.2	100.0
Guides learners in manipulation of learning materials	12.4	6.4	12.0	36.3	32.9	100.0
Facilitates learners to form groups to undertake activities	8.5	5.1	11.1	32.9	42.3	100.0
Gives learners opportunities to ask questions and seek clarification	3.8	1.7	14.5	21.4	58.5	100.0
To assess learning, my teacher:						
Gives students adequate exercises for practice	5.6	1.3	4.3	21.8	67.1	100.0
Gives assignments which are engaging to respond to	11.5	2.6	8.5	25.2	52.1	100.0
Provides prompt feedback for assignments	13.2	12.0	9.8	28.2	36.8	100.0
Facilitates correction of assignments	12.8	5.1	11.5	21.4	49.1	100.0
Asks questions that require specific answers	13.2	9.8	12.4	27.8	36.8	100.0
Asks questions that require explanations	13.7	9.4	14.5	22.6	39.7	100.0

Key; 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree

Data obtained from students on presentation showed that more than three quarters (82.4%) of the students indicated that their teachers continuously engaged them, slightly more than two thirds (69.2%) indicated that their teachers guided them in manipulation of learning materials, about three quarters (75.2%) noted that teachers facilitated them to form groups to undertake activities and more than three quarters (79.9%) acknowledged that they were given opportunities to ask questions and seek clarification. These results suggest that more than three-quarters (76.7%) of the students sampled confirmed that their Mathematics teachers ensured an interactive learning environment during Mathematics lessons.

At the evaluation stage, information obtained revealed that more than three quarters of the students (88.9%) indicated that their teachers gave them adequate exercises for practice, slightly more than

three quarters (77.3%) noted that their teachers gave assignments which were engaging to respond to, close to two thirds (65.0%) indicated that teachers provided prompt feedback for assignments, slightly more than two thirds (70.5%) reported that teachers facilitated correction of assignments, while close to two thirds (64.6%) observed that teachers asked questions that required specific answers and those that required explanations (62.3%). This shows that more than two-thirds (71.4%) of the Form Three students sampled agreed that their Mathematics teachers evaluated learning and provided feedback during Mathematics lessons. Generally, findings imply that slightly less than three quarters of Form Three students (74.1%) indicated that their Mathematics teachers implemented effective Mathematics instructional process activities in the classroom. Table 3 presents data obtained from HOS.

Table 3: Mathematics Instruction (HOS Perspective) N=73

Mathematics instructional process activities	SD	D	N	A	SA	Total
During preparation of Mathematics lesson, teachers:						
Identify learning objectives	2.7	5.5	6.8	23.3	61.6	100.0
Source for relevant content	6.8	4.1	11.0	32.9	45.2	100.0
Source for appropriate instructional resources	9.6	12.3	20.5	20.5	37.0	100.0
Identify appropriate methods of presentation	4.1	2.7	15.1	16.4	61.6	100.0
Select appropriate assessment method	6.8	5.5	19.2	32.9	35.6	100.0
During presentation, teachers:						
Continuously engage learners	2.7	-	6.8	17.8	72.6	100.0
Guide learners in manipulation of learning materials	1.4	-	1.4	27.4	69.9	100.0
Facilitate learners to form groups to undertake activities	2.7	1.4	8.2	11.0	76.7	100.0
Give learners opportunities to ask questions and seek clarification	5.5	8.2	6.8	26.0	53.4	100.0
To evaluate learning, teachers:						
Give students adequate exercises for practice	4.1	5.5	26.0	37.0	27.4	100.0
Give assignments which are engaging to respond to	56.2	9.6	13.7	6.8	13.7	100.0
Provide prompt feedback for assignments	5.5	4.1	2.7	17.8	69.9	100.0
Facilitate correction of assignments	19.2	12.3	27.4	21.9	19.2	100.0
Ask questions that require specific answers	1.4	15.1	13.7	20.5	49.3	100.0
Ask questions that require explanations	23.3	20.5	39.7	2.7	13.7	100.0

Key; 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree

Information obtained from Mathematics HOS showed that more than three quarters (84.9%) affirmed that during preparation for Mathematics lesson, teachers identified learning objectives, slightly more than three quarters (78.1%) observed that teachers sourced for relevant content, while slightly more than half (57.5%) indicated that teachers sourced for appropriate instructional resources. Further, slightly more than three quarters (78.0%) of sampled Mathematics HOS agreed that teachers identified appropriate methods of presentation and slightly more than two thirds (68.5%) reported that teachers selected appropriate assessment methods. This implies that more than two-thirds of teachers (73.4%) ensured adequate preparation for the Mathematics instructional process.

During lesson presentation, a majority of Mathematics HOS indicated that teachers continuously engaged learners (90.4%), guided learners in manipulation of learning materials (97.3%), facilitated learners to form groups to undertake activities (87.7%) and gave learners opportunities to ask questions and seek clarification (79.4%). This implies that most Mathematics HOS (88.7%) agreed that their teachers taught in an engaging and interactive manner during Mathematics lessons. At the evaluation phase, slightly less than two thirds (64.4%) of Mathematics HOS indicated that teachers gave students adequate exercises for practice, slightly less than a quarter (20.5%) observed that teachers gave assignments which were engaging to respond to, while more than three quarters (87.7%) observed that teachers provided prompt feedback for assignments. Additionally, less than half (41.9%) of Mathematics HOS indicated that teachers facilitated correction of assignments, slightly more than two thirds (69.8%) acknowledged that teachers asked questions that required specific answers and very few (16.4%) reported that teachers asked questions that required explanations. Findings obtained showed that less than half (49.98%) of Mathematics HOS agreed their teachers evaluated learning, an indication of inadequate commitment by teachers to formative evaluation and feedback, which is an integral phase of the Mathematics instructional process. This could be partially contributing to the poor learning outcomes in Mathematics in secondary education. Generally, study results show that slightly more than two thirds of Mathematics HOS (70.7%) indicated that their Mathematics teachers adopted effective instructional practices in Mathematics.

Descriptive findings showed that about two thirds (65.0%) of the sampled teachers took time to adequately prepare for Mathematics lessons beforehand. This was confirmed by slightly less than three quarters (73.4%) of the sampled HOS. It generally means that Mathematics teachers adopt appropriate lesson preparation strategies implying their acknowledgement of adequate preparation for instructional process. Finding is consistent with observations by Darling-Hammond (2017), who emphasized that effective lesson preparation requires teachers to align instructional goals with curriculum standards while also considering students' prior knowledge and learning needs. According to Valiandes and Neophytou (2018); Vale and Barbosa (2023) as well as Furner and Santos (2019), the preparation phase is fundamental as it entails the identification of learning

objectives, selection of appropriate content, instructional resources, teaching methods, and evaluation techniques.

The study also showed that a minority of the teachers sampled (38.8%) adopted learner-centered teaching activities during Mathematics lessons. It illustrates that a majority of Mathematics teachers still predominantly adopt teacher centered instructional approach rather than empirically recommended learner-centered instructional approaches which limit optimal learning outcomes for the subject. However, Form Three students and Mathematics HOS reported more favorable outcomes, a significant majority (76.7%, 88.7% respectively) indicating that Mathematics teachers adopt learner centered instructional strategies for lesson presentation. This can be explained by the urge of the students and the HOS as administrators to present a positive image of the teachers despite the reality as confessed by the teachers themselves. Finding is consistent with that of Luneta (2022), who observed that in Africa, Mathematics lesson presentation often faces challenges such as large class sizes and limited resources, yet research suggests that teachers who implement student-centered strategies, such as group discussions and practical problem-solving activities, achieve better learning outcomes. On his part, Boaler (2016), noted that effective lesson presentation should be characterized by student-centered instructional approaches that promote inquiry-based learning and active engagement with mathematical concepts.

Data obtained relative to lesson evaluation showed that more than half of the teachers (58.6%) sampled undertook formative evaluation activities to determine the extent to which learning outcomes had been achieved. This implies that a significant proportion of the sampled teachers (41.4%) were not integrating appropriate formative evaluation strategies for Mathematics instructional process thus hindering effective instruction and ultimate learning outcomes. A similar observation was presented by the HOS, fewer proportion (50.0%) confirming Mathematics teachers' adoption of formative evaluation strategies for Mathematics instruction. However, similar to the presentation phase, students reported more favorable instructional practices than teachers did, with more than two thirds (71.4%) of the students suggesting that their teachers were integrating formative assessment strategies in Mathematics instruction, contrary to the reality on the ground. A study by Black and Wiliam (2018), indicated that formative assessment is widely recognized as an effective strategy for evaluating students' understanding of Mathematics, with research indicating that continuous feedback and student reflection enhance learning outcomes more than conventional summative assessments. However, in Africa, traditional high-stakes examinations often dominate the evaluation process, leading to an emphasis on procedural knowledge rather than conceptual understanding (Luneta, 2022). This observation was supported by Iyamuremye, Ndayambaje and Muwonge (2021) who suggested that incorporating formative assessment strategies such as portfolio assessment and peer evaluation, can significantly enhance students' engagement with mathematical concepts.

In general, findings on the instructional process illustrated that about two thirds (65.0%) of the Mathematics teachers sampled prepare adequately, slightly more than a third (38.8%) adopt innovative learner-centered instructional approaches in presentation, and slightly more than half (58.6%) use formative evaluation. This means that an average number of Mathematics teachers (54.1%) in Lower Eastern region, Kenya, generally integrate innovative learner centered instructional practices during their Mathematics lessons, indicating that many teachers continue to rely on teacher-centered approaches. This could explain the persistent poor learning outcomes for Mathematics generally in the region. The findings from teachers were supported by more than two thirds of sampled students and HOS (74.1%, 70.7% respectively). Iyamuremye et al. (2021) conducted a meta-analysis of research from the last 20 years to evaluate the impact of different Mathematics teaching approaches on student performance in Africa. Their analysis found that teaching methods involving concrete manipulatives had the largest significant effect on performance. Additionally, their study revealed that assessments using open-ended questions were more effective than multiple-choice tests in gauging student understanding. Additionally, Boaler (2016), emphasized that Mathematics instruction that emphasizes reasoning and problem-solving, rather than rote memorization of formulas and procedures, fosters greater student achievement and builds students' confidence in their mathematical abilities. The studies generally agreed that in Mathematics education, teaching approaches significantly influence student performance.

Qualitative data was sought from CQASOs as regards the dynamics of the outcome of Mathematics instructional process. Interviewees were requested to indicate the general trend of students' Mathematics learning outcome in Lower Eastern region, Kenya and the reasons that explain this trend of performance. The interviewees observed that;

> *Generally, the performance of Mathematics in basic education in the region is below average, with boys performing relatively better than girls in the subject*.

According to the interviewees, the poor performance;

> *Could mostly be attributed to negative attitude towards the subject and use of teacher centered methods in the Mathematics instructional process.*

Findings therefore not only confirm the fact that a significant proportion of Mathematics teachers continue to stick to teacher centered instructional approaches in Mathematics instruction but also associates the teachers' predominant use of teacher centered instructional approaches in Mathematics instructional process to students' poor performance in the subject. Hassidov (2017) in a study entitled; the link between teaching methods and achievement in Mathematics in computer-assisted elementary schools established that the teaching method is a decisive factor in student achievement in Mathematics and advised for a change from the traditional teaching methods, incorporating attention to the differing needs and achievements of students. Similarly, Ngu and Phan (2024) in a study entitled; instructional approach and acquisition of mathematical proficiency: Theoretical insights from learning by comparison and cognitive load theory observed that appropriate instructional approaches, informed by the use of both learning by comparison theory

and cognitive load theory, may help to facilitate successful acquisition of multifaceted proficiency strands in Mathematics learning.

The study also sought to assess respondents' views on the dynamics of implementation of the GTPs in Mathematics instruction. Table 4 presents findings from Mathematics teachers.

Table 4: Implementation of Gender Transformative Pedagogies (Teachers)

Use of Gender transformative pedagogies	SD	D	N	A	SA	Total
Makes Mathematics instruction easier	21.1	6.6	19.7	22.4	30.3	100.0
Makes learning interesting	23.7	9.2	30.3	15.8	21.1	100.0
Enables learners to understand concepts easier	17.1	14.5	10.5	26.3	31.6	100.0
Enhances learners' Mathematics skills	14.5	6.6	19.7	42.1	17.1	100.0
Reduces learner independence	26.3	6.6	13.2	25.0	28.9	100.0
Are useful in Mathematics instruction	19.7	5.3	7.9	39.5	27.6	100.0
Enhances active learner participation in learning	13.2	10.5	10.5	34.2	31.6	100.0
Helps both genders feel more confident in solving problems	15.8	13.2	17.1	15.8	38.2	100.0
Ensures more balanced participation by both genders	17.1	13.2	14.5	19.7	35.5	100.0
Generally improves performance of boys and girls	11.8	15.8	19.7	15.8	36.8	100.0
Increases performance gaps between boys and girls	13.2	19.7	17.1	13.2	36.8	100.0
Encourage reflection on how teaching practices affect boys' and girls' learning of mathematics	23.7	9.2	19.7	27.6	19.7	100.0
Improves my overall teaching effectiveness	22.4	1.3	18.4	22.4	35.5	100.0
Are necessary for achieving equitable Mathematics instruction.	9.2	13.2	22.4	22.4	32.9	100.0
Create a conducive learning environment for all learners	7.9	2.6	25.0	22.4	42.1	100.0

Key: 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree

Findings in Table 4 show that slightly more than half of Mathematics teachers sampled believed that use of GTPs makes Mathematics instruction easier (52.7%), reduces learner independence (53.9%), helps both genders feel more confident in solving problems (54.0%), increases performance gaps between boys and girls (50.0%) and generally improves performance of boys and girls (52.6%). At the same time, less than half affirmed that use of GTPs makes learning interesting (36.9%) and encourage reflection on how teaching practices affect boys' and girls' learning of mathematics (47.3%) while slightly more than two thirds (67.1%) of teachers indicated that GTPs are useful in Mathematics instruction. Further, less than two thirds of the teachers indicated that use of GTPs enables learners to understand concepts easier (57.9%), enhances learners' Mathematics skills (59.2%), enhances active learner participation in learning (65.8%), ensures more balanced

participation by both genders (55.2%), improves their overall teaching effectiveness (57.9%), are necessary for achieving equitable Mathematics instruction (55.3%) and creates a conducive learning environment for all learners (64.5%). Findings from the study therefore mean that more than half (55.35%) of Mathematics teachers agreed that use of GTPs contributes towards Mathematics instruction. Study findings from Mathematics HOS were as shown in Table 5

Table 5: Implementation of Gender Transformative Pedagogies (HOS)

Use of Gender transformative pedagogies	SD	D	N	A	SA	Total
Makes Mathematics instruction easier	8.2	11.0	19.2	30.1	31.5	100.0
Makes learning interesting	9.6	11.0	11.0	53.4	15.1	100.0
Enables learners to understand concepts easier	1.4	11.0	5.5	43.8	38.4	100.0
Enhances learners' Mathematics skills	8.2	4.1	17.8	28.8	41.1	100.0
Reduces learner independence	2.7	-	19.2	49.3	28.8	100.0
Are useful in Mathematics instruction	-	9.6	12.3	28.8	49.3	100.0
Enhances active learner participation in learning	1.4	6.8	11.0	16.4	64.4	100.0
Helps both genders feel more confident in solving problems	1.4	6.8	11.0	26.0	54.8	100.0
Ensures more balanced participation by both genders	1.4	4.1	13.7	9.6	71.2	100.0
Generally improves performance of boys and girls	1.4	4.1	8.2	32.9	53.4	100.0
Increases performance gaps between boys and girls	1.4	12.3	1.4	20.5	64.4	100.0
Encourage reflection on how teaching practices affect boys' and girls' learning of mathematics	1.4	-	9.6	16.4	72.6	100.0
Improves my overall teaching effectiveness	1.4	5.5	5.5	39.7	47.9	100.0
Are necessary for achieving equitable Mathematics instruction.	2.7	16.4	17.8	37.0	26.0	100.0
Create a conducive learning environment for all learners	8.2	16.4	24.7	39.7	11.0	100.0

Key: 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree

Findings in Table 5 show that more than half of Mathematics HOS sampled for the study acknowledged that use of GTPs create a conducive learning environment for all learners (50.7%), makes Mathematics instruction easier (61.6%) and are necessary for achieving equitable Mathematics instruction (63.0%) while slightly more than two thirds reported that use of GTPs enhances learners' Mathematics skills (69.9%) and use of GTPs makes learning interesting (68.5%). Additionally, a significant proportion affirmed that use of GTPs enables learners to understand concepts easier (82.2%), reduces learner independence (78.1%), are useful in Mathematics instruction (78.1%), enhances active learner participation in learning (80.8%) and helps both genders feel more confident in solving problems (80.8%). Further, the study illustrates that

integration of GTPs ensures more balanced participation by both genders (80.8%), generally improves performance of boys and girls (86.3%), increases performance gaps between boys and girls (84.9%), encourage reflection on how teaching practices affect boys' and girls' learning of Mathematics (87.6%) and improves overall teaching effectiveness (87.6%). Study findings consequently mean that slightly more than three quarters (76.15%) of Mathematics HOS affirmed that use of GTPs contributes towards Mathematics instruction.

Descriptive findings from the study therefore implied that more than half (55.35%) of Mathematics teachers acknowledged that use of GTPs contributes towards Mathematics instruction. Mathematics teachers' findings was confirmed by slightly more than three quarters (76.15%) of Mathematics HOS who though slightly higher appear to support the observation of Mathematics teachers, affirming that use of GTPs contributes to Mathematics instruction. Mensah, Kyeremaah, Ansu, Karadaar and Junior (2024) conducted a study on improving girls' participation in Mathematics in Ghana. The study established that the use of motivational and gender-sensitive approaches in Mathematics instruction helped improve female students' performance in the subject. Similarly, a study by Van der Merwe and Botha (2024) on the effects of gender-transformative pedagogies in rural schools revealed a marked increase in both boys' and girls' performance in Mathematics, attributing the success to more inclusive teaching practices.

The study thus proceeded to assess the inferential relationship between gender transformative pedagogies and Mathematics instruction in public secondary schools in Lower Eastern region, Kenya. The objective sought to determine the relationship between gender transformative pedagogies and Mathematics instruction. The hypothesis, $H_0$1 formulated for this purpose sought to establish whether there existed a significant relationship between gender transformative pedagogies and Mathematics instruction. The study thus tested the relationship between the practices and techniques adopted by Mathematics teachers in Mathematics instructional process. Binary logistic regression was used for the test. Table 6 and 7 presents the findings.

Table 6: Relationship between Gender Transformative Pedagogies and Mathematics Instruction (Model Summary)

Step	-2 Log likehood	Cox & Snell R^2	Nagel R^2	Model fit			Model Sig.			Obs.	Pre.
				χ^2	df	Sig.	χ^2	df	Sig.		
1	86.281	.186	.252	3.318	1	.169	15.683	1	.000	71.1	60.5

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Independent variable in the model was gender transformative pedagogies. The model was significant $\chi^2(1) = 15.683$, $p<0.001$ and the Hosmer and Lemeshow Test confirmed model fit, $\chi^2(1)=3.318$, $p=0.169$. Cox & Snell R square predicted a variance of 18.6% while Nagelkerke R

square predicted 25.2% variation in Mathematics instruction explained by the model. The model with independent variable explained 71.1% of Mathematics instruction, an improvement from the initial 60.5% initially predicted. Table 7 presents information on variables in the equation.

Table 7: Relationship between Gender Transformative Pedagogies and Mathematics Instruction (Regression Coefficient)

	B	SE	Waldχ^2	df	Sig.	Exp(B)
Gender Transformative Pedagogies	2.015	.552	13.347	1	.000	7.500
Constant	-3.624	.951	14.528	1	.000	.027

b) Variable(s) entered on step 1: Implementation of GTP.

Regression analysis illustrated that integration of gender transformative pedagogies positively and significantly predicted Mathematics instruction, Waldχ^2 (1)=13.347, $p<0.001$, Exp(B) = 7.500. Findings mean that integration of gender transformative pedagogies are positively and significantly related to Mathematics instruction. Therefore, the main hypothesis which stated that there is no statistically significant relationship between gender transformative pedagogies and Mathematics instruction in public secondary schools in the Lower Eastern region, Kenya was rejected. Findings are in agreement with Clarke and Gunter (2021) who carried out a study on implementation of gender-transformative practices in STEM education across several schools. The results revealed that schools that adopted these practices experienced a notable shift in student attitudes toward Mathematics, with a marked increase in female students' engagement and achievement. Similarly, Hernandez and Cudiamat (2018) conducted a study on the integration of gender and development principles in a high school Mathematics curriculum. The study results revealed that gender-sensitive instructional approaches nurtured a more inclusive classroom environment, resulting in improved performance and participation among both male and female students.

In general, the study therefore illustrated that integration of GTPs is positively and significantly related with Mathematics instruction, implying that implementation of GTPs contributes positively to Mathematics instructional process. A study by Hernandez and Cudiamat (2018) on the integration of gender and development principles in a high school Mathematics curriculum established that gender-sensitive instructional approaches nurtured a more inclusive classroom environment, resulting in improved performance and participation among both male and female students. Similarly, Agyei (2021) examined the implementation of gender-responsive strategies in secondary schools and observed that such pedagogies enhanced female students' confidence and participation in Mathematics. Findings from a study by El Fassi (2024), though not on the entirety of the Mathematics instructional process, found no significant differences in Mathematics achievement between girls and boys following the implementation of gender-transformative pedagogies.

5. Conclusion and Recommendation

The study sought to determine the relationship between integration of gender transformative pedagogies and Mathematics instruction. Descriptive findings showed that more than half of Mathematics teachers held that use of GTPs contributes towards Mathematics instruction. Inferential analysis by means of binary logistic regression revealed a positive and significant relationship between integration of gender transformative pedagogies and Mathematics instruction. It can thus be concluded that there exist a positive and significant relationship between integration of gender transformative pedagogies and Mathematics instruction. The study therefore recommends a concerted effort in implementation of GTPs especially in low performing schools where GTPs are minimally used in Mathematics instruction considering that the GTPs have the potential to significantly enhance Mathematics instruction and expected learning outcomes.

6. References

Abdullah, H., Idrus, M., Gao, X., & Muhammad, S. (2024). Teacher Cognition of Gender Gap in the English Language Literacy: A Malaysian Narrative. *SAGE Open*, *14*(4), 21582440241305200.

Agyei, S. (2021). The Impact of Gender-Responsive Pedagogies on Female Students' Engagement in Mathematics in Ghanaian Secondary Schools. *African Journal of Educational Studies*, *18*(2), 234-249.

Ala, G., Yang, H., & Ala, B. (2021). Characteristics and Comparison of Peer-Assisted Learning Interactions among University Students in Harbin, China. *Social Sciences & Humanities Open*, *4*(1), 100164.

Babbie, E., & Mouton, J. (2002). *The Practice of Social Research* (South African ed.). Oxford University Press.

Black, P., & Wiliam, D. (2018). Classroom Assessment and Pedagogy. *Assessment in Education: Principles, Policy & Practice*, *25*(6), 551-575. https://doi.org/10.1080/0969594X.2018.1441807

Boaler, J. (2016). *Mathematical Mindsets: Unleashing Students' Potential Through Creative Math, Inspiring Messages and Innovative Teaching*. Jossey-Bass.

Carr, J., & Hsu, S. (2022). Collaborative Learning and Its Impact On Gender Equity in Mathematics Classrooms. *Journal of Educational Research, 115*(2), 207-221. https://doi.org/10.1080/00220671.2022.2011442

Chege, F., & Kimani, G. (2023). Evaluating the Impact of Gender-Transformative Pedagogies on Mathematics Performance in Western Kenyan Secondary Schools. *Kenyan Journal of Educational Research, 29*(2), 112-130.

Clarke, D., & Gunter, P. (2021). Gender-Transformative Pedagogies in STEM education: A Study of Australian schools. *International Journal of STEM Education, 8*(1), 12. https://doi.org/10.1186/s40594-021-00258-5

Darling-Hammond, L. (2017). Teacher Preparation and Professional Development in the United States: A Research Review. *Education Policy Analysis Archives, 25*, 1-30. https://doi.org/10.14507/epaa.25.2365

El Fassi, H. (2024). The Effectiveness of Gender-Transformative Pedagogies on Academic Performance in Moroccan Secondary Schools. *North African Journal of Educational Research*, *30*(1), 97-112.

Fryer, G., & Levitt, D. (2020). An Empirical Analysis of the Gender Gap in Mathematics. *American Economic Journal: Applied Economics*, *2*(2), 210-240.

Furner, M., & Santos, R. (2019). Strategies for Preparing Effective Mathematics Lessons: A Guide for Teachers. *Mathematics Teaching in the Middle School, 24*(5), 312-319. https://doi.org/10.5951/MTMS.24.5.0312

Gándara, F., & Laesecke, A. (2022). Unpacking the Relationship Between Female Teachers and Gender Gaps in The Democratic Republic of the Congo: The Critical Role of Gender-Sensitive Pedagogy in Student Attendance and Achievement. *Social Sciences & Humanities Open*, *6*(1), 100347.

Gillies, M. (2023). Cooperative learning: Developments in Research. *International Journal of Educational Psychology*, 3(2), 125-140.

Guiso, L., Monte, F., Sapienza, P., & Zingales, L. (2021). Culture, Gender, and Math. *Science*, 320(5880), 1164-1165. https://doi.org/10.1126/science.1164177

Hassidov, D. (2017). The Link Between Teaching Methods and Achievement in Math in Computer-Assisted Elementary Schools. *Creative Education*, *8*(14), 2293.

Hernandez, A., & Cudiamat, A. (2018). Integrating Gender and Development (GAD) in the Classroom: The Case of Lucsuhin National High School, Department of Education-Philippines. *KnE Social Sciences*, 1135-1141.

Iyamuremye, E., Ndayambaje, I., & Muwonge, M. (2021). Effective Mathematics Assessment strategies: A Meta-Analysis of African Studies. *African Journal of Research in Mathematics, Science and Technology Education, 26*(1), 34-52. https://doi.org/10.1080/18117295.2021.2054111

Iyamuremye, E., Ndayambaje, I., & Muwonge, M. (2021). Influence of Teaching Approaches on Students' Performance in Mathematics: A meta-analysis of Quasi-Experimental Studies in Africa. *African Journal of Educational Studies in Mathematics and Sciences*, *17*(2), 73-94.

Luneta, K. (2022). Challenges in Mathematics Instruction in sub-Saharan Africa: A Systematic Review. *African Journal of Research in Mathematics, Science and Technology Education, 26*(2), 211-229. https://doi.org/10.1080/18117295.2022.2058193

Luneta, K. (2022). Special Challenges in Mathematics Education in Sub Sahara Africa. *Current Opinion in Behavioral Sciences, 48*, 101211.

Mafuleka, T. (2023). Gender Responsiveness of the Pre-Service Primary School Teachers' Training Program: The Case of Four Teacher-Training Colleges in Malawi (Doctoral dissertation, Mzuzu University).

Mensah, A., Kyeremaah, E., Ansu, B., Karadaar, B., & Junior, G. (2024). Improving Girls' Participation in Mathematics at Dormaa Akwamu R/C Primary Three (3) Using Motivational and Gender–Sensitive Approaches. *2*(2), 15-27.

Mukagiahana, J., Sibomana, A., & Ndiritu, J. (2024). Teachers' Understanding of Gender Responsive Pedagogy and its Application in Teaching Process: Case After Teacher Training Program Interventions in Rwanda. *Journal of Pedagogical Research*, *8*(1), 280-293.

Mukisa, S., & Bwanika, P. (2022). Gender-Transformative Pedagogies and Mathematics Achievement in Ugandan Secondary Schools: A Critical Assessment. *East African Journal of Education Research*, 18(4), 45-59.

Mutua, M., & Ochieng, W. (2022). Gender-Transformative Approaches in Mathematics Instruction in Kenyan Secondary Schools. *Journal of Educational Research, 115*(3), 239-251. https://doi.org/10.1080/00220671.2022.2051450

Mwangi, J., Wairimu, S., & Muriithi, N. (2022). The Influence of Instructional Approaches on Students' Performance in Mathematics in Public Secondary Schools in Kenya. *Journal of Educational Research and Reviews, 10*(5), 90-100.

Ngu, H., & Phan, P. (2024). Instructional Approach and Acquisition of Mathematical Proficiency: Theoretical Insights from Learning by Comparison and Cognitive Load Theory. Asian *Journal for Mathematics Education, 3*(3), 357-379.

Njoroge, P., Mutuku, D., & Otieno, J. (2021). Gender Differences in Mathematics Achievement among Secondary School Students in Kenya. *Journal of Educational Policy and Entrepreneurial Research*, *8*(4), 120-130.

Okafor, C., & Adewumi, M. (2022). Gender-Transformative Pedagogies and their Impact on Girls' Mathematics Performance in Nigerian Secondary Schools. *Nigerian Journal of Education Science, 39*(1), 58-72.

Sanders, K., & Lee, H. (2020). Global Impacts of Gender-Transformative Pedagogies in Mathematics Education: A Multi-Country Analysis. *Journal of Education and Social Policy, 11*(1), 46-59.

Schoenfeld, H. (2016). *Mathematical thinking and problem solving*. Routledge.

Thabiti, H., Mwandilawa, B., & Basela, J. (2023). Implementation of Gender-Responsive Teaching Methods Among Secondary School Teaching Staff in Mafia District, Tanzania. *Archives of Current Research International, 23*(7), 130-142.

Tiwari, Y. (2024). Analyzing Gender Representation in English Textbooks (IX & X) through Gender Schema Theory. *Lumbini Journal of Language and Literature, 4*(1), 123-144.

Vale, I., & Barbosa, A. (2023). Mathematics Lesson Planning: The foundation of effective instruction. *Journal of Mathematics Education, 35*(1), 89-105. https://doi.org/10.1080/0020739X.2023.2150024

Valiandes, S., & Neophytou, L. (2018). Effective Differentiated Instruction in Mathematics Classrooms: The Role of Teachers' Planning. *Teaching and Teacher Education, 75*, 147-156. https://doi.org/10.1016/j.tate.2018.06.011

Van der Merwe, S., & Botha, L. (2024). Enhancing Mathematics Performance through Gender-Responsive Teaching: A Case Study in South African Rural Schools. *South African Journal of Science and Education*, 25(3), 450-467.

Vijayan, V. (2024). *Unveiling the Power of Teacher Education Promoting Gender Equality in Education*. Research Culture Society and Publication.

Vygotsky, S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.