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The Learner as a Focal Point in Enhancing Mathematical Proficiency at Junior Secondary Schools in Suna East Sub-County, Migori County, Kenya

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Abstract

This study examined the relationship between learner-based factors and mathematical proficiency among Grade 9 learners in Junior Secondary Schools in Suna East Sub-County, Kenya. Guided by Social Cognitive Theory, the study adopted a mixed-methods approach, combining a correlational quantitative strand with qualitative interviews and focus-group discussions (FGDs). The sample comprised 276 Grade 9 learners, 23 Mathematics teachers and 23 school administrators. The 23 Mathematics teachers completed the questionnaires, while administrators participated in interviews and learners in FGDs. Quantitative data were analyzed using descriptive statistics and Pearson's product-moment correlation, while qualitative data were analyzed thematically. Teacher responses indicated generally positive perceptions of learners' confidence, self-belief, self-regulation, concentration, interest and persistence, although Mathematics anxiety was also evident. FGD and interview findings reinforced themes of confidence and self-belief, self-regulated learning, emotional engagement and anxiety, and motivation and persistence. The study highlights learner-based factors as important dimensions of Mathematics learning, while the reported Pearson correlation ($r = .386$, $p = .749$) requires verification against the original SPSS output before the inferential finding is considered final.

Key terms: Learner-based factors, mathematical proficiency, mathematics anxiety, self-efficacy, self-regulation.

1.0 INTRODUCTION

This study examined the relationship between learner-based factors and mathematical proficiency among Grade 9 learners in Junior Secondary Schools in Suna East Sub-County, Kenya. It sought to determine the relationship between learner-based factors and mathematical proficiency among Grade 9 learners in Junior Secondary Schools in Suna East Sub-County, Kenya. It sought to answer the research question: What is the relationship between learner-based factors and mathematical proficiency among Grade 9 learners in Junior Secondary Schools in Suna East Sub-County, Kenya?

Mathematical proficiency is an important component of educational development because Mathematics provides learners with the knowledge and skills required for reasoning, problem solving, and participation in science, technology, and other mathematically oriented fields. Mathematical proficiency extends beyond producing correct answers and encompasses several dimensions of mathematical understanding and performance (Juandi & Turmudi, 2024). It is a multidimensional construct conceptualised through different but related dimensions.

Within the Kenyan education system, Mathematics occupies a central position in basic education and remains an important subject within the transition to secondary and senior school pathways. Developing mathematical competence is therefore important not only for academic progression but also for learners' capacity to engage with everyday quantitative problems and future STEM-related learning. Nevertheless, mathematical achievement remains challenging in many educational contexts. Evidence from studies of junior and secondary school learners indicates that mathematical performance is associated with a range of cognitive, affective and behavioural factors rather than with instructional variables alone (Peteros et al., 2020).

Learners differ in learner-based factors including confidence, beliefs about their mathematical abilities, capacity to regulate learning, emotional responses to Mathematics, concentration, interest and willingness to persist when tasks become difficult. Self-efficacy and self-concept have received considerable attention in Mathematics research. Peteros et al. (2020) found a significant relationship between Mathematics self-concept and academic performance among junior high school learners. Self-regulated learning represents another important learner-based factor. Mathematics requires learners to plan, monitor and evaluate their learning, practice procedures and examine errors. Learners who can regulate their study behaviour may be better positioned to engage consistently with mathematical tasks. Recent research also indicates that self-regulated learning interacts with learners' beliefs and learning environments rather than operating independently.

Emotional factors are equally relevant. Mathematics anxiety may affect learners' concentration, participation and willingness to attempt mathematical tasks. Anxiety should, however, not be interpreted simply as an inherent learner weakness. It may be influenced by previous experiences of failure, assessment pressure, classroom interactions, perceived difficulty and the support available to learners. Interest, concentration and persistence also contribute to learners' engagement with Mathematics. Learners who perceive Mathematics as meaningful and interesting may be more willing to invest effort. At the same time, persistence may determine whether learners continue working when an initial strategy does not produce a solution. These characteristics may themselves be shaped by classroom experiences, teacher feedback, learning materials and opportunities for successful participation.

Previous research has established relationships between individual learner characteristics and Mathematics achievement. However, much of the literature examines constructs such as self-concept, self-efficacy, motivation, self-regulation or Mathematics anxiety separately. This approach provides valuable information but may offer a fragmented understanding of how several learner characteristics operate together in real school settings. Evidence from other countries and educational levels cannot automatically be generalised to Grade 9 learners in Kenyan JSSs because curricula, assessment practices, school resources, teacher practices and learners' social environments differ. Kenyan evidence at the JSS level concerning the combined influence of learner-based characteristics remains comparatively limited.

2.0 LITERATURE REVIEW

Learner-based factors comprise characteristics that may shape learners' engagement with mathematical tasks. In the present study, the construct included confidence, self-belief, self-regulation, Mathematics anxiety, concentration, interest, and persistence. The multidimensional nature of mathematical proficiency makes it inappropriate to assume that a single learner characteristic can adequately explain mathematical performance. Helsa et al. (2024) show that researchers have conceptualised mathematical proficiency through multiple dimensions, reinforcing the importance of examining the interaction between learners' mathematical engagement and their broader learning characteristics.

Confidence refers to learners' perceived ability to understand Mathematics, while self-belief concerns learners' expectations that they can successfully undertake mathematical tasks. These characteristics are closely related to self-efficacy and self-concept. From the perspective of Social Cognitive Theory, perceived capability may affect task choice, effort, and persistence. Learners who believe that they can succeed may be more willing to attempt challenging problems, while repeated unsuccessful experiences may weaken confidence. Peteros et al. (2020) found a significant relationship between Mathematics self-concept and academic performance among junior high school learners. Their findings provide contextual support for considering learners' perceptions of their mathematical abilities when examining mathematical performance. However, the study was conducted in the Philippines and involved a different educational context, meaning that its findings should not be transferred directly to Kenyan JSS learners.

Self-regulated learning involves learners' ability to plan, monitor and evaluate their own learning. In Mathematics, this may involve setting learning goals, allocating time for practice, checking solutions and correcting errors. Self-regulation is particularly relevant to Mathematics because mathematical proficiency develops through sustained engagement with concepts and problems. Learners need opportunities to practice, reflect on mistakes and modify strategies. Recent Kenyan research also supports the importance of self-regulation. Materi and Ndambuki (2025) reported a positive relationship between self-regulated learning and Mathematics achievement among secondary school learners in Meru South Sub-County. The present study extends this line of inquiry by examining self-regulation as one component of a broader learner-based construct among Grade 9 learners.

Mathematics anxiety describes negative emotional reactions associated with Mathematics learning and assessment. Anxiety may interfere with attention and participation and may reduce learners' willingness to engage with difficult mathematical tasks. Omar et al. (2022) reported a relationship between Mathematics anxiety and Mathematics achievement among secondary school students, while Hiller et al. (2022) examined Mathematics anxiety and self-efficacy as predictors of Mathematics literacy. These studies

suggest considering emotional and motivational characteristics alongside cognitive variables when investigating Mathematics performance. Mathematics anxiety should not be understood exclusively as an individual learner deficit. Classroom climate, assessment practices, previous experiences, and teacher responses to mistakes may shape learners' emotional experiences of Mathematics.

Concentration enables learners to sustain attention during explanations, practice and problem solving. Interest, on the other hand, may influence the willingness to engage with mathematical tasks. Jumabong and Escandallo (2025) reported a relationship between Mathematics proficiency and attitudes towards learning Mathematics. The finding supports the importance of affective engagement, although the context differs from that of the present study. Teaching practices may also influence interest. Practical activities, real-world examples, appropriate technology and collaborative learning may make mathematical tasks more meaningful. Consequently, learner interest should be understood as both a learner characteristic and something learning experiences may shape.

Persistence concerns learners' willingness to continue working on difficult mathematical problems rather than abandoning a task. Mathematics problem solving often requires learners to try alternative procedures, identify errors and revise their approaches. Research on motivation similarly suggests that learners' willingness to engage with Mathematics is associated with their learning outcomes. Jehadus et al. (2022), for example, examined tutoring and learning motivation in relation to Mathematics achievement among junior high school students. Persistence should nevertheless not be treated as a purely individual attribute. Teacher encouragement, feedback, peer support and access to learning materials may provide conditions that enable learners to continue engaging with difficult tasks.

Learner-based factors are relevant to Mathematics learning but do not operate independently. Confidence may affect persistence; self-regulation may support sustained practice; anxiety may interfere with concentration; and interest may increase willingness to participate. The present study therefore examined these characteristics as a composite learner-based construct while also examining their individual descriptive patterns. The mixed-methods design further enabled the study to compare teachers' structured perceptions with learners' and administrators' accounts.

Theoretical Framework

The study drew on Social Cognitive Theory (Bandura, 1997). The theory proposes that learning and behaviour result from reciprocal interactions among personal factors, behaviour and environmental conditions. It is particularly appropriate because the study examined personal characteristics such as confidence, self-belief and anxiety alongside behavioural characteristics such as self-regulation and persistence. Learners' experiences in Mathematics may influence their beliefs, while those beliefs may subsequently influence their behaviour. It also prevents the study from presenting learner-based factors as isolated causes of mathematical proficiency. Teachers, peers, learning materials, classroom practices and school expectations form part of the environment within which learner characteristics develop and operate.

Conceptual Framework

The independent variable, learner-based factors, comprises confidence in understanding Mathematics, self-belief in performing Mathematics, self-regulated learning, Mathematics anxiety, concentration, interest and enthusiasm, and persistence in solving difficult Mathematics problems. These factors are conceptually

linked to the dependent variable, mathematical proficiency, which is operationalised through learners' mathematical problem-solving performance.

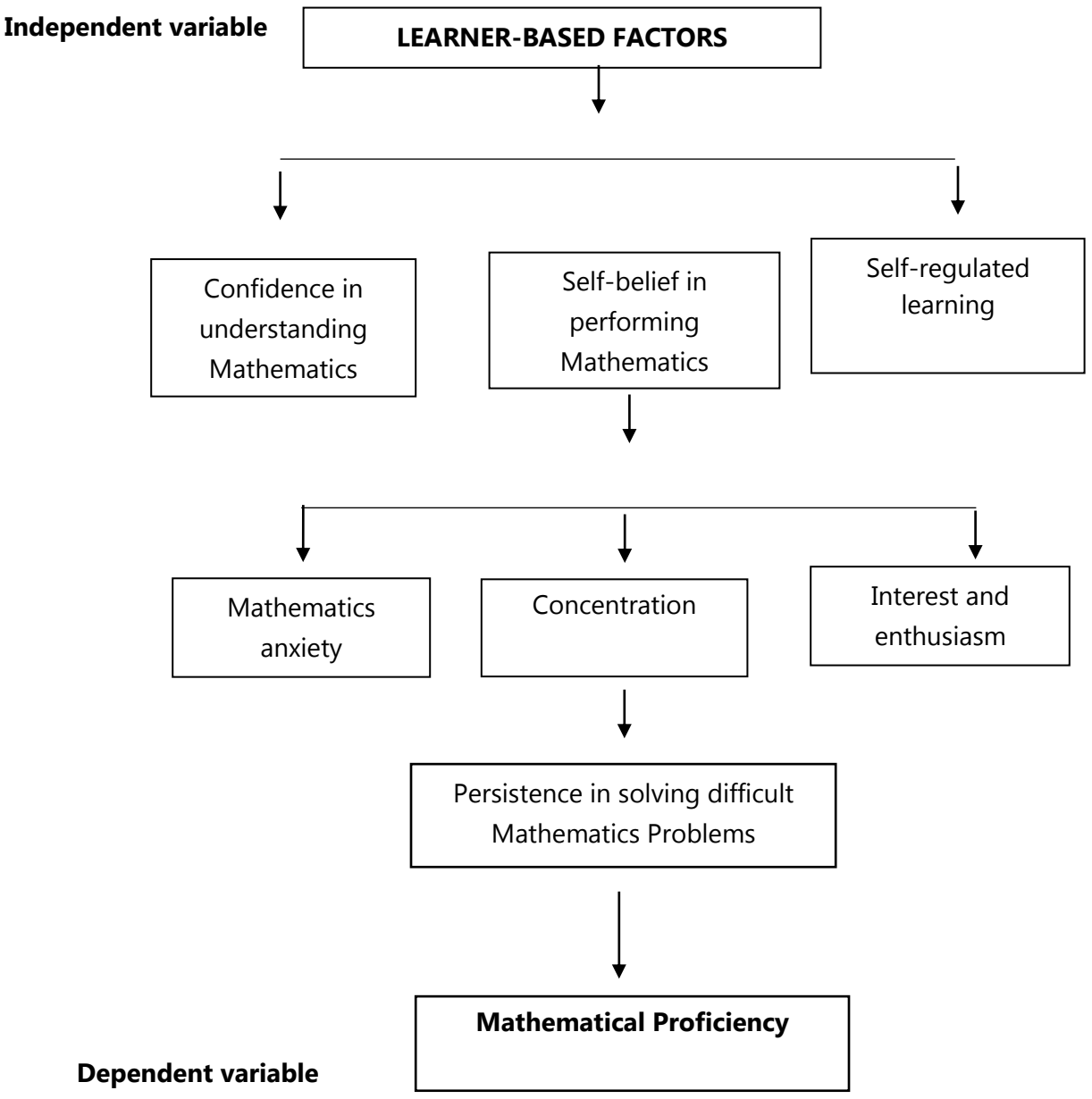


Figure 1 : Conceptual Framework of Learner-Based Factors and Mathematical Proficiency
Independent Variable

3.0 METHODOLOGY

The study adopted a mixed-methods approach. The quantitative component employed a correlational design, while the qualitative component used interviews and focus-group discussions. The quantitative correlational design was appropriate because the study sought to establish the direction and strength of association between learner-based factors and mathematical proficiency without manipulating the variables. The qualitative component complemented the quantitative strand by providing context for

learner experiences and school-level observations. Quantitative findings established patterns in teachers' questionnaire responses, while qualitative findings from administrators and learners contextualised those patterns. The study was conducted in Suna East Sub-County, Migori County, Kenya.

Table 1: Target Population and Sample Size

Respondent category	Target population	Sample size
Grade 9 learners	2,768	276
Mathematics teachers	70	23
School administrators	70	23
Total	**2,908**	**322**

The target population consisted of 2,908 participants. The study sampled 276 Grade 9 learners, 23 Mathematics teachers and 23 school administrators. The researchers selected Grade 9 learners through stratified sampling. The researchers selected Mathematics teachers through simple random sampling and purposively selected administrators because of their institutional knowledge and direct involvement in school-level academic activities.

Mathematics teachers completed the structured questionnaires. The administrators participated in interviews, while Grade 9 learners participated in FGDs. The researchers selected Grade 9 learners from the participating schools for FGDs. The questionnaire contained items measuring teachers' perceptions of learner-based factors, including confidence, self-belief, self-regulation, mathematics anxiety, concentration, interest and persistence. The administrator interview schedule elicited institutional perspectives on learner characteristics and mathematics learning, while the FGD guide explored learners' experiences of mathematics learning. Specialists in Educational Psychology and Science at Rongo University reviewed the research instruments. The review focused on relevance, clarity, construct coverage, and alignment between the instruments and the study objective. The questionnaire's internal consistency was assessed using Cronbach's alpha. The reported coefficient was $\alpha = .78$, indicating acceptable internal consistency. The researcher obtained the required research permissions before data collection. Because Grade 9 learners are minors, the study required appropriate parental/guardian consent and learner assent. The researcher maintained confidentiality and anonymity throughout the research process.

Quantitative questionnaire data were analysed using frequencies, percentages, means and standard deviations. Pearson's product-moment correlation was used to examine the relationship between learner-based factors and mathematical proficiency. The researchers analysed interview and FGD data thematically. The researchers coded recurring responses, grouped them into categories, and synthesised them into themes. Selected participant statements illustrated the themes.

4.0 FINDINGS AND DISCUSSION

Table 2: Mathematics Teachers' Perceptions of Learner-Based Factors

Learner-Based Factor	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	SD
Learners are confident in their ability to understand Mathematics concepts	1 (3.1)	2 (6.3)	18 (56.3)	11 (34.4)	4.19	.821
Learners believe they can perform well in Mathematics	1 (3.1)	6 (18.8)	15 (46.9)	9 (28.1)	3.94	.948
Learners are self-regulated when studying Mathematics	1 (3.1)	7 (21.9)	15 (46.9)	8 (25.0)	3.88	.942
Learners show anxiety when preparing for Mathematics lessons or tests	1 (3.1)	12 (37.5)	13 (40.6)	6 (18.8)	3.75	.803
Learners remain focused during Mathematics learning activities	1 (3.1)	3 (9.4)	17 (53.1)	10 (31.3)	4.06	.914
Learners show strong interest and enthusiasm when learning Mathematics	3 (9.4)	1 (3.1)	13 (40.6)	14 (43.8)	4.06	1.216
Learners persist in solving difficult Mathematics problems	1 (3.1)	4 (12.5)	16 (50.0)	10 (31.3)	4.03	.933

The results in Table 2 indicate a generally favourable perception of learners' confidence in understanding Mathematics concepts. The item had a mean of 4.19 (SD = .821). Of the teachers who responded, 56.3 per cent agreed and 34.4 per cent strongly agreed that learners were confident in their ability to understand Mathematics concepts. In comparison, 6.3 per cent were neutral, and 3.1 per cent disagreed. Thus, 90.7 per cent of the teachers expressed a positive view of learners' confidence. This was the highest mean among the learner-based factors examined in the study.

The qualitative findings help explain what teachers meant by confidence. Rather than describing confidence simply as a feeling, participants associated it with what learners did when faced with Mathematics work. HOI05 observed that confident learners were more willing to work independently, while those who lacked confidence tended to wait for the teacher to provide guidance:

Learners' confidence in doing mathematics is very important. Learners who are confident in their ability to do mathematics consistently show positive changes in mathematics, which improves their academic success. They become proficient in mathematics tests and even during class assignments. But some learners lack confidence in their ability to do mathematics; they always wait for the teacher to guide them through procedures, which makes them score poorly in mathematics. [HOI05]

A similar view emerged from the learners. FGD010 associated confidence with willingness to tackle questions from both the teacher and textbooks and observed that such learners tended to obtain better Mathematics grades:

Most learners are confident in their ability in mathematics, and these learners' record good grades in mathematics. In our class, some learners are confident in tackling any mathematics problem given by the teacher or in our textbooks, and they consistently score better in mathematics. [FGD010]

These accounts explain the high quantitative rating. In the participating schools, learners showed confidence in their readiness to start a task, attempt a problem without waiting for immediate assistance, and continue working when the solution was not immediately obvious. The researcher views this as important because, in the present study, confidence concerns learners' perceived ability to understand Mathematics. It was therefore expressed through participation and task initiation rather than existing only as a stated attitude.

Peteros et al. (2020) found a significant relationship between Mathematics self-concept and academic performance among junior high school learners. Their study was conducted in the Philippines, so the findings cannot be transferred directly to the Kenyan Junior Secondary School setting. They nevertheless provide useful evidence for the present interpretation because both studies point to the relevance of learners' perceptions of their mathematical capability in relation to Mathematics performance.

Social Cognitive Theory offers a similar explanation. Learners' beliefs about what they can accomplish are expected to affect the tasks they undertake, the effort they make and whether they continue when difficulties arise. HOI05 and FGD010 explained that learners who believed they could manage Mathematics were described as more willing to begin the work, whereas those with weaker confidence were more dependent on teacher assistance.

The researcher does not interpret the high confidence rating as evidence that confidence itself produced higher Mathematics proficiency. The data are descriptive, and the qualitative accounts are participants' perceptions of the relationship. Prior mathematical knowledge, teaching approaches, access to learning materials and other learner-based factors may also have contributed to the observed performance. Confidence is therefore better understood here as one characteristic accompanying learners' engagement with Mathematics.

Teachers gave a mean of 3.94 (SD = .948) to the statement that learners believed they could perform well in Mathematics. The response distribution shows that 46.9 per cent agreed and 28.1 per cent strongly agreed, giving a combined positive response of 75.0 per cent. However, 18.8 per cent were neutral, and 3.1 per cent disagreed, indicating generally positive self-belief in understanding Mathematics concepts.

The qualitative evidence provides some explanation. HOI01 linked self-belief to learners' willingness to discuss work they had already completed:

Students' self-belief in whatever they have done or what they do contributes a lot to their performance, especially in mathematics. Those who do their work and believe in what they have done feel free to consult after their work, and these learners consistently perform better in mathematics than those who do not. [HOI01]

The learner account from FGD015 points to a different consequence of weak self-belief. Some learners reportedly doubted answers that they had initially produced correctly and replaced them with answers copied from their peers:

Some learners do not believe in what they have done or what they are doing, and even others end up cancelling the right answer and copying their friends' work, which lowers their grades in mathematics. Most learners believe in what they are doing, which helps them approach mathematics tasks and boosts their grades. [FGD015]

What stands out in these accounts is how they respond to uncertainty. A learner may know how to approach a problem but still question whether the answer is correct. The researcher interprets participants' responses to mean that self-belief may affect how learners use the knowledge they already possess. Those who trust their own work may be more prepared to present it seek clarification or defend a solution. Those who lack that belief may withdraw from their own reasoning even when their initial response is correct.

Peteros et al. (2020) also reported a significant relationship between Mathematics self-concept and academic performance among junior high school learners. The Philippine context differs from that of the present study. Still, the comparison is useful because it situates learners' perceptions of their mathematical ability within the broader discussion of Mathematics performance.

Social Cognitive Theory also helps distinguish self-belief from actual mathematical ability. A learner's perception of capability can affect whether they attempt a task and how much effort they devote to it. In the present study, this was evident in learners' willingness to attempt problems, consult teachers and maintain confidence in their answers.

The researcher regards self-belief and confidence as related but not interchangeable. In this study, confidence concerns understanding Mathematics concepts, whereas self-belief concerns the learner's expectation of performing well. The lower mean for self-belief may therefore indicate that understanding a concept and feeling capable of demonstrating that understanding are not always the same experience.

Learner self-regulation recorded a mean of 3.88 (SD = .942). The response distribution shows that 46.9 per cent of teachers agreed and 25.0 per cent strongly agreed that learners were self-regulated when studying Mathematics, giving a combined positive response of 71.9 per cent. A further 21.9 per cent were neutral, while 3.1 per cent disagreed. The responses therefore point to generally positive self-regulated learning behaviour, although a sizeable proportion of teachers did not express a definite position.

The qualitative accounts give the result a practical meaning. Administrators referred to learners who continued practising Mathematics on their own, while learners reported that regular practice, including practice outside formal lesson periods, helped them become more prepared. Some learners also continued working when teachers were unavailable.

The researcher understands these behaviours as evidence of self-regulation because the learners were not simply responding to an immediate teacher instruction. They took responsibility for when and how they practised Mathematics. In this study, self-regulation therefore involved organising learning, maintaining practice, and continuing with mathematical work when direct assistance was not immediately available.

The reviewed literature defines self-regulated learning as planning, monitoring, and evaluating one's own learning. In Mathematics, this can be seen when learners set goals, allocate time for practice, check solutions and identify errors. These activities are closely connected to the demands of mathematical problem solving, where arriving at an answer often requires learners to examine their own reasoning rather than wait for a teacher to provide the next step.

Materi and Ndambuki (2025) reported a positive relationship between self-regulated learning and Mathematics achievement among secondary school learners in Meru South Sub-County. Their Kenyan context makes the comparison useful. However, the present study differs in its treatment of self-regulation because it is part of the wider learner-based construct among Grade 9 learners rather than an independent explanatory variable.

Social Cognitive Theory views learners as active participants in their own learning. Self-regulation fits this view because learners can monitor and adjust their behaviour while responding to the learning environment. Some learners continued practising Mathematics even when a teacher was not directly supervising them, providing a practical example of the process.

Self-regulation does not exist independently of the school environment. Learners need opportunities to practice, appropriate learning materials and routines that permit independent work. The ability to regulate learning depends partly on whether the surrounding learning conditions allow learners to exercise that independence.

The mean for Mathematics anxiety was 3.75 (SD = .803). Teachers reported that 40.6 per cent agreed and 18.8 per cent strongly agreed that learners experienced anxiety when preparing for Mathematics lessons or tests, giving a combined positive response of 59.4 per cent. Meanwhile, 37.5 per cent were neutral, and 3.1 per cent disagreed. Although anxiety had the lowest mean among the learner-based indicators, the percentage agreeing or strongly agreeing shows that it remained a noticeable experience among the learners.

The qualitative evidence makes this less favourable aspect of the findings more apparent. HOI09 described Mathematics anxiety as a major concern among learners:

Mathematics anxiety is a major issue among learners. Encouraging learners to avoid fearing mathematics can help them to improve their performance in mathematics, and when they develop a positive mind towards mathematics, learners can be proficient in mathematics. (HOI09)

FGD017 similarly associated fear of Mathematics with poor overall performance and suggested that more frequent interaction with Mathematics might reduce that fear:

Most learners fear mathematics, which makes our overall mean score very low in mathematics. If learners could interact with mathematics more frequently, this fear could be reduced; therefore, Grade 9 learners should avoid mathematics anxiety so they can achieve better grades. (FGD017)

The researcher finds this result useful in interpreting the learner-based construct as a whole. The learners could be described as confident and interested while also experiencing anxiety in particular situations.

Confidence and anxiety, therefore, should not be treated as opposite ends of a single scale. A learner may participate actively in ordinary Mathematics lessons and still become anxious when faced with a test, a difficult problem or the possibility of giving an incorrect answer.

Omar et al. (2022) reported a relationship between Mathematics anxiety and Mathematics achievement among secondary school students. Hiller et al. (2022) also examined Mathematics anxiety together with self-efficacy in relation to Mathematics literacy. These studies provide support for considering emotional experiences alongside other learner characteristics when examining Mathematics performance.

Another point should not be overlooked. Mathematics anxiety cannot automatically be placed entirely within the learner. The reviewed literature recognises the possible contributions of classroom climate, assessment practices, previous experiences, and teachers' responses to mistakes. The present qualitative evidence points in the same direction because participants linked anxiety to the experience of doing Mathematics and to the perceived difficulty of the subject.

Social Cognitive Theory accommodates this relationship between personal experience, behaviour and the learning environment. Anxiety may affect whether learners approach a difficult task, while repeated experiences of difficulty or failure may subsequently alter how capable they believe themselves to be. In this sense, anxiety may be connected with concentration, confidence and self-belief rather than operating as an isolated learner characteristic. Anxiety is therefore a genuine part of the learner-based construct, but not a fixed weakness within individual learners. The accounts suggest that the conditions under which Mathematics is taught and assessed can matter to how anxiety is experienced.

Learner concentration had a mean of 4.06 (SD = .914). The response distribution was largely positive: 53.1 per cent of teachers agreed, and 31.3 per cent strongly agreed that learners remained focused during Mathematics learning activities, giving a combined positive response of 84.4 per cent. Another 9.4 per cent were neutral, and 3.1 per cent disagreed. This relatively high percentage of positive responses aligns with the mean and indicates that learners generally perceived concentration favourably.

The qualitative findings, however, show that not every learner had this experience. HOI020 described morning Mathematics remedial lessons that were introduced after learners had recorded low Mathematics grades:

In our school, local arrangements for remedial lessons every morning, specifically for Mathematics, help our learners a lot. We did this after realising that learners scored very low grades in Mathematics, and this arrangement has helped them gain confidence and stay focused on their ability in Mathematics. This has helped a lot, as we have seen a positive change in the results of most Grade 9 learners, though some are still behind. [HOI020]

The learner account presents the other side of the situation:

Some learners do not like mathematics, and they do not even concentrate in class. They either revise other subjects or sit and watch others do mathematics because they are not confident and not focused, which lowers their mathematics performance. Those who do concentrate and are focused perform better in mathematics. [FGD03]

These accounts suggest that concentration was not experienced simply as an unchanging personal characteristic. The remedial lessons described by HOI020 have given learners more opportunities to engage with Mathematics, and the administrator associated these sessions with increased confidence and focus. FGD03, by contrast, shows how a lack of interest and confidence may accompany disengagement during Mathematics lessons.

The reviewed literature treats concentration as sustained attention during activities such as explanations, practice and problem solving. No specific recent study in the literature reviewed for this study directly examined concentration among Kenyan Grade 9 Mathematics learners. The present qualitative evidence therefore adds contextual information about how concentration was understood within the participating schools, rather than directly replicating previous findings.

Social Cognitive Theory is relevant here because it views learner behaviour in relation to personal and environmental conditions. Confidence and interest may affect attention, while the organisation of instruction and opportunities for successful participation may also influence whether learners remain focused.

Teachers reported a mean of 4.06 (SD = 1.216) for learners' interest and enthusiasm in Mathematics. The response distribution shows that 40.6 per cent agreed and 43.8 per cent strongly agreed, giving a combined positive response of 84.4 per cent. Only 3.1 per cent were neutral, while 9.4 per cent disagreed. Although the overall rating was positive, the relatively large standard deviation indicates considerable variation in teachers' perceptions.

The qualitative findings help explain this variation. Learners reported greater interest when Mathematics lessons involved interactive materials, practical activities and technology. Administrators also referred to learning resources, recognition and opportunities for active participation when discussing learners' motivation. Whiteboards, graph boards, laptops and the virtual STEM laboratory were among the resources mentioned.

These provide evidence that interest responded to what happened during Mathematics lessons. This matters because interest was measured as a learner-based characteristic, yet the participants did not describe it as something that existed entirely within the learner. The type of activity, the resources available, and the opportunity to participate appeared to affect whether learners found Mathematics engaging.

Jumabong and Escandallo (2025) reported a relationship between Mathematics proficiency and attitudes towards learning Mathematics. Their work nevertheless provides a basis for considering learners' affective orientation towards Mathematics when interpreting Mathematics learning. Social Cognitive Theory also provides a reasonable explanation for the pattern observed here. A learner who is already interested in Mathematics may participate more actively, while an engaging learning experience may increase that interest. The accounts concerning practical activities, interactive resources and technology illustrate how personal characteristics and learning conditions can affect one another.

The standard deviation of 1.216 is important in interpreting the result, but so is the response distribution. Although 84.4 per cent of teachers agreed or strongly agreed, 9.4 per cent disagreed, and 3.1 per cent

were neutral. The mean therefore gives a generally favourable picture without suggesting that every learner showed the same level of interest. Persistence had a mean of 4.03 (SD = .933). Half of the teachers (50.0%) agreed that learners persisted in solving difficult Mathematics problems, while 31.3 per cent strongly agreed. Together, 81.3 per cent responded positively. A further 12.5 per cent were neutral, and 3.1 per cent disagreed. The result indicates that persistence was generally observed, although the responses also leave room for differences among learners.

The qualitative findings help explain the conditions under which learners appeared willing to keep working. HOI04 described the effect of recognising high-performing learners:

When subject champions are awarded gifts during end-of-term exam release, they feel motivated to do mathematics and even improve their performance. This also motivates others to work harder to get these gifts, and all of this helps learners to score well in their mathematics tasks. Learners who are not motivated always score low grades in mathematics. [HOI04]

A learner also pointed to the role of learning resources:

Mathematics has been a problem, but it is soon becoming one of the best subjects. The introduction of whiteboards, graph boards, and even virtual STEM labs, along with mathematics learning materials on school laptops, motivates learners because they interact with these during class lessons and revision. [FGD07]

These accounts suggest that persistence was not simply a matter of learners deciding internally to continue. Recognition, repeated practice, teacher support and access to resources were part of the conditions participants associated with continued engagement. Persistence reflects learner-based factors, and how it is expressed can depend on what learners encounter in their learning environment.

The reviewed literature describes persistence as the willingness to continue working on a difficult mathematical task rather than abandoning it. In problem solving, persistence may involve trying another procedure, identifying an error or revising an earlier approach. Jehadus et al. (2022) examined tutoring and learning motivation in relation to Mathematics achievement among junior high school students. Their study did not measure persistence in the same way as the present study, but it provides relevant evidence for considering motivational processes when examining Mathematics learning.

The present findings also show a relationship between persistence and the learning environment. Recognition of achievement encourages learners to invest more effort, while interactive materials make continued practice easier or more attractive. Teacher encouragement and feedback may have a similar role. Persistence should therefore not be understood as a quality that learners either possess or lack.

Social Cognitive Theory helps explain why these factors can work together. Beliefs about capability can affect the effort a learner is prepared to invest in a difficult task, while feedback and successful experiences can alter those beliefs. Persistence can therefore emerge from the interaction between what learners believe they can do and what happens when they attempt the work. Persistence is not the same as mathematical proficiency. A learner can continue working on a difficult problem and still reach an incorrect answer. In this study, persistence is therefore treated as a behavioural dimension of engagement with

Mathematics rather than as a direct measure of whether the learner has mastered the mathematics involved.

Table 3: Pearson Correlation between Learner-Based Factors and Mathematical Proficiency

Independent Variable	Inferential Statistical Test	orrelation with dependent variable [Mathematics proficiency] (Mathematical Problem Solving)
Learner based factors variables	Pearson Correlation	.386[a]
	Set Sig. (2-tailed) (α)	.05
	Observed P value	.749[b]

The descriptive and qualitative findings indicate that learner-based characteristics are important in Mathematics learning. Teachers generally perceived learners as confident, self-regulated, focused, interested and persistent, although Mathematics anxiety was also evident. The finding on confidence aligns with evidence linking Mathematics self-concept to performance (Peteros et al., 2020), while the presence of anxiety is consistent with studies associating it with Mathematics performance (Hiller et al., 2022; Omar et al., 2022). Qualitative findings further showed that interactive resources, practical activities and recognition supported learners' interest, consistent with evidence linking attitudes towards Mathematics with mathematical proficiency (Jumabong & Escandallo, 2025). The findings suggest that learner-based factors operate as interconnected characteristics: confidence may support persistence, self-regulation may facilitate practice, interest may strengthen engagement, and anxiety may hinder concentration. Teachers, learning resources, remedial activities and school practices also shaped these experiences, supporting Social Cognitive Theory's view that learning results from interactions among personal characteristics, behaviour and environment.

5.0 CONCLUSION AND RECOMMENDATIONS

Conclusion: The study concludes that learner-based factors are an important dimension of Mathematics learning among Grade 9 learners in the participating JSSs. Teachers generally perceived learners as demonstrating positive confidence, self-belief, self-regulation, concentration, interest and persistence, although Mathematics anxiety remained a notable concern. Qualitative findings further showed that learner engagement was influenced by both personal characteristics and the learning environment, particularly teacher encouragement, practice opportunities, learning resources and interactive learning activities. The findings therefore indicate that mathematical proficiency is associated not only with learners' cognitive abilities but also with their beliefs, emotions and learning behaviours within the classroom environment.

Recommendations: The study recommends that mathematics teachers should create supportive learning environments that build realistic learner confidence through achievable challenges, constructive feedback and opportunities for success, while treating mistakes as part of the learning process. They should integrate self-regulated learning strategies by guiding learners to set goals, plan practice, monitor progress, check solutions and reflect on errors. Schools should also address Mathematics anxiety through supportive classroom and assessment practices that allow learners to attempt tasks without excessive fear of failure and to discuss difficulties openly. Mathematics instruction should incorporate practical activities, appropriate learning resources, collaborative problem solving and relevant real-world examples to sustain interest and participation. School administrators should support these practices by providing adequate

learning materials, opportunities for remedial instruction and recognition of learner effort and improvement. Interventions should address learner characteristics alongside instructional practices, classroom climate and school resources, recognising that mathematical proficiency develops through the interaction of learner and environmental factors.

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