A Mediated Model of Perceived Usefulness: Career Aspirations and Mathematics Motivation in Ghana

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ABSTRACT

This study examined the mediating role of perceived usefulness in the relationship between career aspirations and mathematics motivation among senior high school students in Ghana. Anchored in the expectancy-value theory, the study employed a quantitative, descriptive survey design involving 265 students from two senior high schools in the Sekyere Kumawu District. Data were collected through a structured questionnaire and analyzed using Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM) via AMOS. The results revealed that career aspirations significantly predicted both perceived usefulness and mathematics motivation. Perceived usefulness also had a significant positive effect on mathematics motivation and partially mediated the relationship between career aspirations and motivation. The findings suggest that students' perceptions of the usefulness of mathematics play a crucial role in translating their career aspirations into motivation for learning. The practical and theoretical implications of enhancing mathematics learning through relevance-oriented instructional practices are discussed.

Keywords: Stem Education, Student Engagement, Expectancy-Value Theory, Students' Perception

INTRODUCTION

In Ghana, as in many parts of the world, mathematics plays a crucial role in shaping students' academic pathways and career choices. The subject is not only foundational for many Science, Technology, Engineering, and Mathematics (STEM) fields, but it also influences students' self-concept, motivation, and long-term aspirations (Akayuure & Akayuure, 2024; Akpalu et al., 2025). However, despite its importance, many students perceive mathematics as difficult, abstract, or irrelevant, which can decrease both their motivation to learn and their aspirations to pursue mathematics-intensive careers (Akayuure & Akayuure, 2024; Akpalu et al., 2025).

Motivation in mathematics is one of the strongest predictors of student achievement. Students who are motivated tend to show greater persistence, higher engagement, and improved performance in mathematics learning (Boadu et al., 2023; Akendita et al., 2024). Career aspirations, which reflect students' goals and expectations about their future work, also influence their attitudes toward mathematics. When students recognize that mathematics is connected to their future careers, they are more likely to value the subject and put in effort to succeed (Arhin, 2018; Wrigley-Asante et al., 2022). An important factor that links career aspirations and motivation is perceived usefulness. Perceived usefulness refers to a student's belief that studying mathematics will be beneficial for achieving personal or professional goals. Evidence from recent studies shows that perceived usefulness shapes students' engagement and learning outcomes across different educational contexts (Ortiz-López et al., 2024). It is also increasingly recognized as a mechanism that connects career goals with motivation for specific subjects, including mathematics (Peng, 2025; Luo et al., 2024).

In Ghana, mathematics motivation has been studied in relation to teaching methods, peer tutoring, and cultural values (Boadu et al., 2023; Akayuure & Akayuure, 2024; Dookurong, 2025). However, the mediating role of perceived usefulness in explaining how career aspirations influence motivation has not been adequately tested. Understanding this pathway is important because it can explain why some students with high career aspirations remain motivated in mathematics, while others do not.

Examining this relationship has both theoretical and practical importance. Theoretically, it adds clarity to how motivation develops when career goals are aligned with subject relevance. Practically, it can inform teachers and policymakers to design interventions that emphasize the usefulness of mathematics for future careers, thereby strengthening students' motivation and achievement (Sigus et al., 2025). This study, therefore, proposes a mediated model in which perceived usefulness mediates the effect of career aspirations on mathematics motivation among Ghanaian students. By testing this model, the study addresses a significant gap in the literature and contributes evidence to support strategies that connect mathematics learning with students' future goals.

Statement of the Problem

Mathematics remains a critical subject for national development and individual career advancement, yet many Ghanaian students continue to show low motivation and declining interest in the subject (Amponsem et al., 2024; Gyasi et al., 2024). Although mathematics is essential for STEM-related careers, a gap persists between students' aspirations and their readiness to pursue mathematics-intensive fields (Wrigley-Asante et al., 2022). Research in Ghana and other contexts has shown that students' perceptions of the usefulness of mathematics strongly predict their motivation and persistence in learning the subject (Gyasi et al., 2024; Amponsem et al., 2024). However, while motivation and career aspirations have been studied independently, less is known about how perceived usefulness may mediate the relationship between these two constructs, particularly in African contexts (Caspi & Gorsky, 2024; Mayerhofer et al., 2024).

This gap in knowledge presents both a theoretical and practical challenge. At the theoretical level, more evidence is required to test the applicability of expectancy-value models of achievement motivation in Ghanaian classrooms (Eccles, 2020; Mayerhofer et al., 2024). Practically, without a clear understanding of how perceived usefulness mediates the link between students' career aspirations and mathematics motivation, interventions to improve mathematics learning may remain ineffective or misdirected (Amponsem et al., 2024; Wrigley-Asante et al., 2022). Addressing this problem is therefore essential to improving students' mathematical competencies, shaping realistic career pathways, and supporting Ghana's broader educational and economic goals (Gyasi et al., 2024; Wrigley-Asante et al., 2022).

Research Objectives

1. To examine the effect of career aspirations on students' motivation toward mathematics.
2. To investigate the mediating role of perceived usefulness in the relationship between career aspirations and mathematics motivation.
3. To assess the influence of perceived usefulness on students' motivation toward mathematics.

Research Hypothesis

H1: Career aspirations have a significant positive effect on students' mathematics motivation.

H2: Perceived usefulness significantly mediates the relationship between career aspirations and mathematics motivation.

H3: Perceived usefulness has a significant positive effect on students' mathematics motivation.

Significance of the Study

This study is significant because it explores how students' perceptions of the usefulness of mathematics mediate the relationship between their motivation to learn the subject and their career aspirations within the Ghanaian context. Understanding this mediating role offers valuable insights for educators and policymakers to develop strategies that enhance mathematics learning and career guidance. The findings will further help teachers design classroom practices that connect mathematics to real-life applications, fostering students' motivation and long-term aspirations. The study also contributes to the broader theoretical understanding of mathematics education by testing a mediated model within the expectancy-value framework.

LITERATURE REVIEW

Perceived usefulness (utility value)

Perceived usefulness is defined as the belief that learning a subject will help achieve future goals (Eccles, 2020). Studies consistently show that higher perceived usefulness predicts greater effort, persistence, and improved learning outcomes in mathematics and related courses (Piesch, Wigfield & Eccles, 2020; Mayerhofer et al., 2024). Experimental and quasi-experimental interventions that encourage students to reflect on the utility of mathematics produce measurable increases in perceived usefulness and, in many cases, subsequent gains in motivation and performance (Dehne et al., 2023; Totonchi et al., 2023). In the Ghanaian context, recent survey research also links students' ratings of mathematics' usefulness to higher motivation and achievement, indicating that utility beliefs operate similarly across contexts (Amponsem et al., 2024; Awoniyi & Amponsah, 2023).

Career aspirations

Career aspirations refer to the occupations or professional pathways students intend to pursue and constitute important personal goals that shape motivation (Wrigley-Asante, Ackah & Frimpong, 2022). Empirical studies show that students who aspire to pursue STEM or mathematics-intensive careers place greater instrumental value on mathematics and are more likely to engage in goal-directed study behaviours (Caspi et al., 2024; Wrigley-Asante et al., 2022). Research in Ghana highlights contextual drivers of aspirations such as role models, parental influence, and perceived economic opportunities which in turn affect how students evaluate the relevance of school subjects (Wrigley-Asante et al., 2022; Mayerhofer et al., 2024).

Mathematics motivation

Mathematics motivation is a multi-faceted construct encompassing interest, self-efficacy, task persistence, and goal orientation (Eccles, 2020; Awoniyi, 2023). In Ghana, quantitative studies with SHS samples report positive associations between motivational dimensions and mathematics achievement, and identify perceived usefulness and classroom factors as important predictors of motivation (Awoniyi, 2023; Gyasi et al., 2024). Mediation analyses in recent Ghanaian work illustrate how intermediate variables (e.g., history of mathematics concepts, prior experiences) transmit the effects of beliefs about mathematics into motivational outcomes, supporting the use of mediated SEM approaches for unpacking causal pathways (Gyasi et al., 2024; Amponsem et al., 2024). Internationally, longitudinal and intervention studies corroborate that increasing perceived utility often raises motivation, especially when interventions also connect learning to students' futures or career goals (Piesch et al., 2020; Dehne et al., 2023).

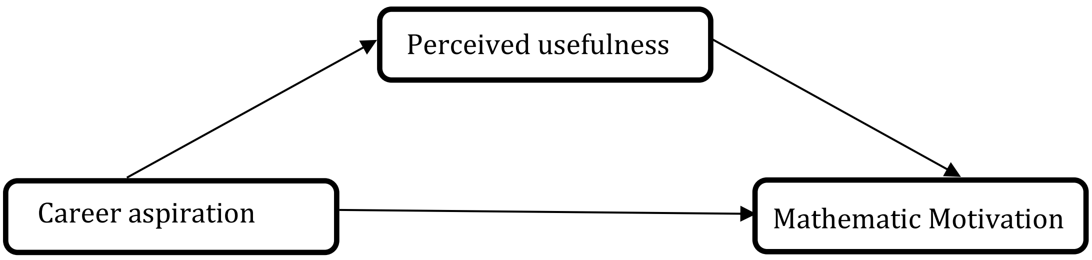

Figure 1: Conceptual Framework

METHODOLOGY

Research paradigm and design

Anchored in the positivist paradigm, which views reality as objective and measurable (Cohen et al., 2018), this study employed a quantitative approach. Creswell & Creswell (2018) defines this as the systematic collection and analysis of numerical data to explain phenomena. A descriptive survey design was used, which Babbie (2020) explains as gathering data from a sample or population to describe characteristics without manipulating variables.

Population

The study involved a total population of 852 students drawn from SHS 2 and SHS 3 classes in two senior high schools within the Sekyere Kumawu District. Of this population, 438 students were from Bankoman Senior High School, while 414 students were from Bodomase Senior High/Technical School.

Sampling and sample size

From the total population of 852 students, a sample size of 265 was determined based on Krejcie and Morgan's (1970) sample size determination table. Proportionate stratified sampling was employed to ensure fair representation of students from both schools and levels (SHS 2 and SHS 3). Using this technique, 136 students were selected from Bankoman Senior High School and 129 students from Bodomase Senior High/Technical School. This approach ensured that each school was proportionally represented in the study sample.

Instrument

A structured questionnaire served as the primary tool for collecting quantitative data in this descriptive study. Questionnaires were chosen because they are widely regarded as the most common instrument in descriptive research, offering the advantages of easy administration to large populations and the capacity for comprehensive statistical analysis (Hair et al., 2019).

Data was collected by the use of questionnaire developed by the researcher. The questionnaires were grouped under four (4) sections. These sections are;

A. Demographics

Under this section, personal and academic information of participants were collected. Under this section was:

i. Gender
ii. Age
iii. School
iv. Level of education
v. Program of study

B. Career Aspiration (CA)

Data on career aspirations (CA) were collected using a Likert-scale questionnaire developed by the researcher. The instrument included items such as:

i. I have a clear idea of the career I want to pursue after school.

ii. My choice of career is influenced by my interest in mathematics.

iii. I often think about how my career will relate to what I learn in mathematics.

C. Perceived Usefulness of Mathematics (PUM)

Data on the Perceived Usefulness of Mathematics (PUM) were obtained through a Likert-scale questionnaire designed by the researcher. This instrument contained items such as:

i. Mathematics is useful for solving real-life problems.
ii. The mathematics I learn in school will help me in my future career.
iii. Mathematics is important for understanding technology and science.

D. Mathematics Motivation (MM)

Data on Mathematics Motivation (MM) was collected using a Likert-scale questionnaire developed by the researcher. The instrument included items such as:

i. I enjoy studying mathematics.
ii. I want to do well in mathematics because it makes me feel successful.
iii. I feel confident when solving mathematics problems.

Ethical Considerations

The study adhered to standard ethical procedures for educational research. Permission was obtained from school authorities, and informed consent was sought from participants. Respondents were assured of confidentiality, anonymity, and voluntary participation. Data collected were used solely for academic purposes, stored securely, and handled in compliance with institutional and national data protection policies. Ethical standards followed the principles outlined by the American Psychological Association (APA, 2020) and Creswell & Creswell (2018) on ethical quantitative research practices.

Data Analysis Techniques

Data were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics summarized respondents' demographic information. Reliability and validity of the measurement scales were assessed through Cronbach's Alpha, Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA). EFA was conducted using Principal Component Analysis with Varimax rotation to explore underlying factor structures of the three latent constructs that are Career Aspirations (CA), Perceived Usefulness of Mathematics (PUM), and Mathematics Motivation (MM).

The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity were used to verify sampling adequacy and factorability (Hair et al., 2019; Tabachnick & Fidell, 2019). Confirmatory Factor Analysis (CFA) was then employed to test the measurement model and ensure construct validity using AMOS 26. The model fit was evaluated using indices such as Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Goodness of Fit Index (GFI), and Root Mean Square Error of Approximation (RMSEA) (Kline, 2021). Finally, Structural Equation Modeling (SEM) tested the hypothesized mediational relationships among the variables, consistent with guidelines by Byrne (2016) and Hooper, Coughlan & Mullen (2020).

Respondent Information

Table 1 Learners' Background Information for a Total of 265 Learners

Background Information	*Frequency*	*Percentage (%)*
Sex		
Male	161	60.8
Female	104	39.2
Level		
Form 3	131	49.4
Form 2	134	50.6

Source: Field survey (2025)

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Out of 265 respondents, 60.8% were male and 39.2% were female as indicated in table 1. In terms of educational level, 49.4% were in Form 3 and 50.6% in Form 2. This indicates a nearly even distribution across levels and gender, ensuring representativeness of the SHS student population in the Sekyere Kumawu District. The demographic balance enhances the generalizability of the findings, supporting prior observations that mathematics classrooms in Ghana typically maintain gender parity due to government efforts toward STEM inclusion (Ministry of Education, 2023; UNESCO, 2024).

Validity and Reliability

Construct validity was evaluated through both EFA and CFA. The EFA yielded three clear factors corresponding to the theoretical constructs with strong loadings (≥ .73), confirming factorial validity. The KMO value (.805) and Bartlett's Test ($\chi^2 = 2829.506$, $p < .001$) confirmed data suitability for factor analysis.

Table 2: Cronbach alpha values

Constructs	Items	Value
Perceived Usefulness (PUM)	5	.893
Career Aspirations (CA)	5	.896
Mathematics Motivation (MM)	5	.916

Source: Field Survey, 2025

Reliability was established using Cronbach's alpha as indicated in table 2 above, with all constructs exceeding the recommended .70 threshold (Nunnally 1994). Specifically, PUM (.893), CA (.896), and MM (.916) indicated excellent internal consistency. CFA results further confirmed convergent validity (AVE > .5) and composite reliability (CR > .7), supporting the robustness of the measurement model.

RESULTS

Results of the Exploratory Factor Analysis (EFA)

Table 3: Factor Loadings

Item	Component		
	1	2	3
MM3	.795		
MM4	.881		
MM5	.899		
MM6	.880		
MM7	.864		
CA1		.808	
CA2		.838	
CA3		.831	
CA4		.886	
CA5		.829	
PUM3			.747
PUM5			.730

PUM6			.900
PUM7			.919
PUM8			.872

Total variance explained= 72.350%, KMO= 0.805, Chi-square value = 2829.506, and a degree of freedom level of 105. Significant level=0.000, Determinant=1.738E-05

EFA results in Table 3 revealed three distinct components corresponding to Career Aspirations, Perceived Usefulness, and Mathematics Motivation. The KMO value (.805) and significant Bartlett's Test (χ^2 = 2829.506, $p < .001$) confirmed sample adequacy. The three extracted components explained 72.35% of total variance, exceeding the 60% benchmark for social sciences (Hair et al., 2019). This approach was applied because it enhances the interpretability of factors while minimizing cross-loadings among items. Each item's significance and relevance were carefully evaluated to determine retention. Items that loaded on multiple components or exhibited low factor loadings were removed, and model fit indices were reassessed after each deletion. The final rotated component matrix revealed that nine items were eliminated, with all remaining factor loadings exceeding 0.70 across the respective components

Results of the Confirmatory Factor Analysis (CFA)

Table 4 presents the outcomes of the Confirmatory Factor Analysis (CFA). The CFA model was refined to align with the measurement structure established during the Exploratory Factor Analysis (EFA). Data were analyzed using a sample of 265 participants, representing the total study sample, and processed with AMOS version 26.0. To achieve an acceptable model fit, minor modifications were made, including the removal of items with low factor loadings below 0.5

Table 4: Confirmatory Factor Analysis

PERCEIVED USEFULNESS (PUM) CA=0.893; CR=0.889; AVE=0.628	**Standard Factor Loadings**
Doing well in mathematics will improve my career opportunities.	.571
Learning mathematics will help me achieve my long-term goals.	.545
Mathematics is relevant to my everyday life.	.921
Understanding mathematics will help me manage money and personal finances.	.961
I believe mathematics is an important subject for success in life.	.863
CAREER ASPIRATIONS (CA) CA=0.896; CR=0.897; AVE=0.638	
I have a clear idea of the career I want to pursue after school	.721
My choice of career is influenced by my interest in mathematics.	.749
I often think about how my career will relate to what I learn in mathematics.	.779
I believe studying mathematics can help me achieve my future career goals.	.922
I am determined to work hard in mathematics to reach my career aspirations.	.807
MATHEMATICS MOTIVATION (MM) CA=0.916; CR=0.922; AVE=0.704	
I want to do well in mathematics because it makes me feel successful.	.729
I feel confident when solving mathematics problems.	.891
I work hard in mathematics even when it is challenging.	.868
I look forward to mathematics lessons.	.889
I believe I can achieve high grades in mathematics.	.807

Model fit indices: CMIN=121.760; df=81; CMIN/df=1.503; CFI=0 .985; TLI=.981; GFI=0.985; & RMSEA=.044

The CFA tested the measurement model and showed excellent model fit indices: CMIN/df = 1.503; CFI = .985; TLI = .981; GFI = .985; RMSEA = .044. These values meet recommended thresholds (CFI, TLI > .95; RMSEA < .06), indicating that the data fit the hypothesized model well (Kline, 2021). Factor loadings ranged from .545 to .961, all above .50, confirming convergent validity. The Average Variance Extracted (AVE) values (.63–.70) and Composite Reliability (CR) values (.89–.92) indicated strong internal consistency and validity. The findings indicate that, overall, the model demonstrates a good fit and can be considered acceptable.

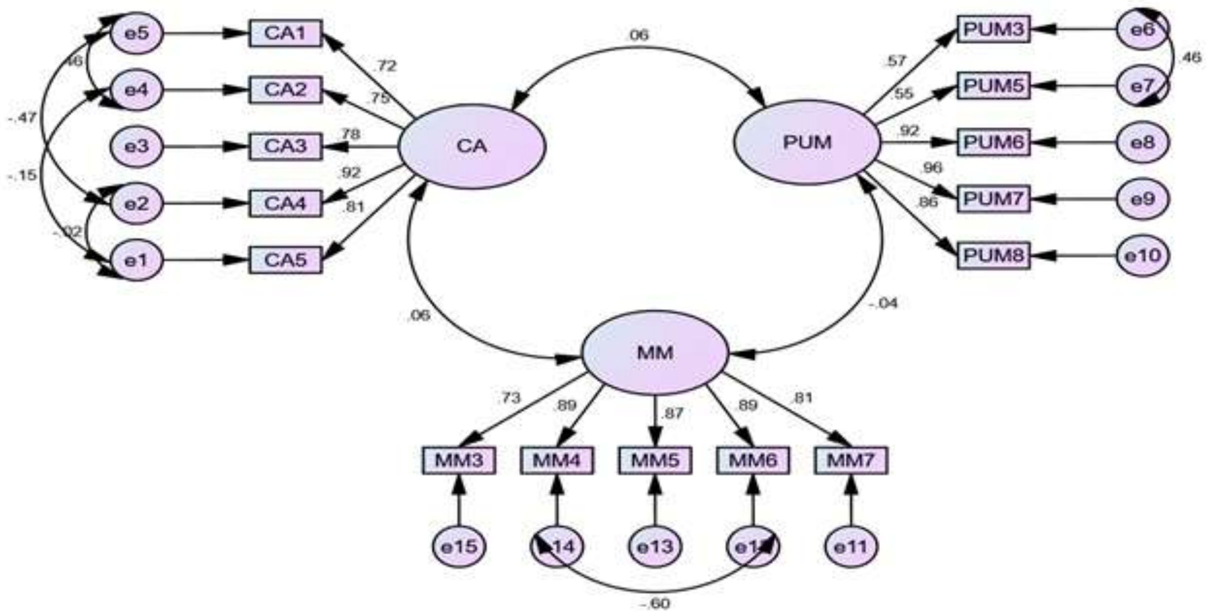

Figure 2: Confirmatory factor analysis (CFA) of the 3 variables.

Results of the Path Analysis

A summary of the path analysis results, including both direct and indirect effects, is presented in Table 5 below.

Table 5: Hypothetical analysis results

Path estimate	Estimate	B.S.E.	BCp CI 95% CI		P VALUE
Direct	B		LL	UL	
CA→PUM	0.535	0.230	0.431	0.631	0.012
CA→MM	0.371	0.053	0.243	0.628	0.000
PUM→MM	0.346	0.073	0.241	0.511	0.001
Indirect Paths (Mediators)	**Estimate**	**B.S.E.**	**BCp CI 95% CI** **LL**	 **UL**	**P VALUE**
CA→ PUM→MM	0.185	0.042	0.074	0.261	0.002
Total Effect	0.556	0.321	0.264	0.714	0.001

Field survey (2025) Model fit indices: CMIN=318.782; df=184; CMIN/df=1.733; CFI=0 .987; TLI=.995; IFI=0. 986; GFI=0.934; & RMSEA=.046

Table 5 presents the summary of the structural model, showing both direct and indirect (mediated) effects among Career Aspirations (CA), Perceived Usefulness of Mathematics (PUM), and Mathematics Motivation (MM). The results revealed that Career Aspirations had a significant positive effect on both Perceived Usefulness ($\beta = 0.535$, $p = 0.012$) and Mathematics Motivation ($\beta = 0.371$, $p < 0.001$). This implies that students with well-defined career goals tend to perceive mathematics as more useful and exhibit higher motivation toward learning it.

Furthermore, Perceived Usefulness had a significant positive effect on Mathematics Motivation ($\beta = 0.346$, $p = 0.001$), suggesting that students who recognize the relevance of mathematics to their future careers are more motivated to engage in the subject. The mediation analysis also showed a significant indirect effect of Career Aspirations on Mathematics Motivation through Perceived Usefulness ($\beta = 0.185$, $p = 0.002$). This confirms that Perceived Usefulness acts as a partial mediator in the relationship between Career Aspirations and Mathematics Motivation. In other words, students' motivation to learn mathematics is partly influenced by how useful they perceive the subject to be in achieving their future goals. The overall model demonstrated an excellent fit, as indicated by the model fit indices: CMIN = 318.782, df = 184, CMIN/df = 1.733, CFI = 0.987, TLI = 0.995, IFI = 0.986, GFI = 0.934, and RMSEA = 0.046. These indices fall within the acceptable thresholds recommended by Kline (2021) and Hair et al. (2019), confirming that the hypothesized mediation model adequately represents the observed data.

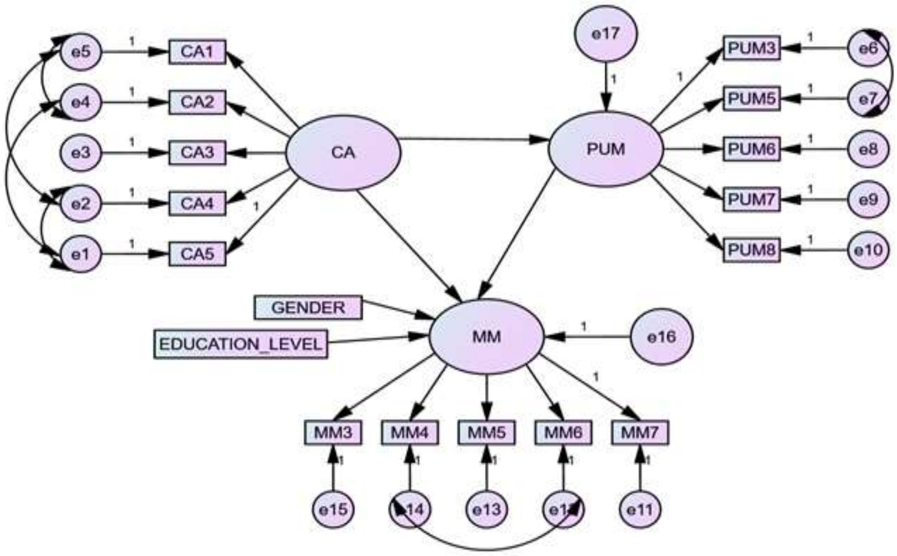

Figure 3: Path diagram Source: Field Survey (2025)

DISCUSSION OF FINDINGS

The discussion below interprets the findings based on the three research objectives and hypotheses.

Objective 1: Effect of Career Aspirations on Mathematics Motivation

The first objective examined the direct effect of career aspirations on students' motivation toward mathematics. The path analysis revealed a significant positive relationship ($\beta = 0.371$, $p < 0.001$), indicating that students with well-defined career goals are more likely to be motivated to learn mathematics. This finding aligns with the Expectancy-Value Theory, which suggests that learners are more motivated when they perceive academic tasks as instrumental to achieving future goals (Eccles 2020). Empirically, this result supports earlier work by Arhin (2018), who found that Ghanaian students' study behaviors are strongly influenced by their future occupational aspirations.

This finding highlights that the development of mathematics motivation is not only dependent on classroom instruction but also on students' personal visions for the future. When learners connect mathematics to future careers such as engineering, finance, or medicine, they are more likely to invest effort and persistence, even when faced with academic challenges.

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Objective 2: Mediating Role of Perceived Usefulness

The second objective sought to examine whether perceived usefulness mediates the relationship between career aspirations and mathematics motivation. The results confirmed a significant indirect effect ($\beta = 0.185$, $p = 0.002$), indicating that perceived usefulness partially mediates the relationship. In other words, students' career aspirations influence their mathematics motivation primarily through the extent to which they perceive mathematics as useful for achieving their future goals.

This outcome aligns with the findings of Dehne et al. (2023), who reported that interventions designed to enhance students' perceptions of the utility of academic tasks significantly increased motivation and engagement. Hulleman (2023) similarly demonstrated that emphasizing the relevance of mathematics to students' personal and professional lives significantly improves persistence and performance in mathematics-related courses.

This mediation reinforces the expectancy-value framework, which positions utility value (perceived usefulness) as a central determinant of academic motivation (Eccles & Wigfield, 2020). By perceiving mathematics as a means to future success, students transform abstract learning experiences into personally meaningful and goal-oriented activities. In the Ghanaian context, where many students struggle to see the real-world applicability of mathematics, highlighting its usefulness may therefore bridge the gap between aspiration and sustained effort (Akayuure 2024).

Objective 3: Influence of Perceived Usefulness on Mathematics Motivation

The third objective examined the direct effect of perceived usefulness on mathematics motivation. The findings showed a significant positive relationship ($\beta = 0.346$, $p = 0.001$), indicating that students who believe mathematics is relevant and beneficial are more motivated to learn it. This finding supports numerous studies which have established perceived usefulness as a strong predictor of student motivation, engagement, and achievement in mathematics (Eccles et al., 2020; Mayerhofer et al., 2024; Boadu et al., 2023). These results confirm that the way students' value mathematics, especially in relation to their future aspirations, plays a key role in sustaining long-term engagement.

Therefore, interventions that strengthen students' perceptions of mathematics as useful can be pivotal in improving learning outcomes. Teachers who use culturally relevant examples and career-oriented lessons help students recognize how mathematics connects to real-world contexts and future occupations.

Practical and Theoretical Implications

Practically, teachers should design classroom activities that connect mathematics to real-world and career contexts, while career guidance programs should highlight the relevance of mathematics in various professions. Theoretically, the study validates expectancy-value theory in a Ghanaian SHS context, demonstrating that perceived usefulness functions as a mediating cognitive mechanism in motivation development, reinforcing its cross-cultural applicability (Eccles et al.., 2020; Mayerhofer et al., 2024).

CONCLUSION

The study concludes that students' motivation in mathematics is significantly shaped by their career aspirations and perceptions of usefulness. Perceived usefulness plays a critical mediating role, emphasizing the need for educational interventions that connect mathematics learning to future goals. Strengthening students' utility beliefs about mathematics can bridge the gap between aspirations and sustained engagement.

Limitations

This study adopted a quantitative, descriptive survey design, which, while effective for identifying patterns and testing hypothesized relationships, inherently limits the ability to establish causal inferences between career aspirations, perceived usefulness, and mathematics motivation. Furthermore, the reliance on a localized sample from two senior high schools within the Sekyere Kumawu District constrains the generalizability of the findings to the broader population of Ghanaian students. Finally, because the data were collected through a one-time questionnaire where students reported on themselves, the results may be affected by response bias and do not capture how motivation changes over time.

Directions for Future Research

Future studies should employ longitudinal or experimental designs to confirm and extend the causal pathways suggested by this model. Specifically, utility-value interventions that explicitly connect mathematics to students' personal futures could be tested within Ghanaian classrooms to establish causal effects on motivation and aspiration. Research should also expand to more diverse and nationally representative samples to enhance the external validity of the findings. Finally, qualitative studies are needed to examine how cultural, family, and socio-economic conditions in Ghana influence students' career goals and how they view the usefulness of mathematics, allowing for a deeper understanding of the context.

RECOMMENDATION

It is recommended that mathematics education in Ghanaian senior high schools be made more relevant to students' future careers and everyday experiences. Teachers should adopt instructional approaches that clearly demonstrate how mathematical concepts apply to real-world contexts and professional fields. When students understand the usefulness of mathematics in achieving their aspirations, their motivation and commitment to learning are likely to increase significantly. Furthermore, career guidance programs should be strengthened to help students make clear connections between mathematics and diverse career pathways. Continuous professional development should also be provided for teachers to equip them with strategies for integrating career relevance into classroom instruction. Such efforts will not only enhance students' motivation and achievement but also contribute to Ghana's broader goal of advancing STEM education for national growth.

REFERENCES

1. Akayuure, F. A. (2024). Examining fresh students' achievement motivation and self-efficacy towards learning high school mathematics. (Conference/local journal).DOI/URL: https://uew.edu.gh/node/60978
2. Akendita, P. A., Obeng, B. A., Abil, M., & Ahenkorah, M. (2024). Investigating the effect of socio-constructivist mathematics teaching on students' mathematics achievement: The mediating role of mathematics self-efficacy. *Educational Point, 1*(2), e110. https://doi.org/10.71176/edup/15662
3. Akpalu, R., Boateng, P. A., Asare, E. A., & Owusu, J. (2025). Students' perceptions of mathematics and the impact on their achievement among Senior High School students in Ghana. *International Journal of Research and Innovation in Social Science, 9*(1). https://doi.org/10.47772/IJRISS.2025.9010299
4. American Psychological Association. (2020). *Publication Manual of the American Psychological Association* (7th ed.). Washington, DC: American Psychological Association.DOI/URL: https://apastyle.apa.org/products/publication-manual-7th-edition
5. Amponsem, M. K., Yarhands Dissou, A., Bonyah, E., & Asare, B. (2024). Enhancing students' achievement in mathematics through usefulness of mathematics and interest: The mediating role of motivation. Malaysian Mental Health Journal, 3(1), 22-29. https://mmhj.com.my/archives/1mmhj2024/1mmhj2024-22-29.pdf
6. Arhin, V. (2018). Relationship between career aspirations and study behaviours among second year distance learners of the University of Cape Coast, Ghana. (Conference paper / thesis).DOI/URL: https://eric.ed.gov/?id=EJ1208435
7. Awoniyi, F. C., & Amponsah, K. D. (2023). Positive attitudes toward mathematics among senior high school students in Cape Coast Metropolis. Journal of Education and Learning, 17(2), 183-194. https://pure.ug.edu.gh/en/publications/positive-attitudes-toward-mathematics-among-senior-high-school-st-3
8. Babbie, E. R. (2020). The practice of social research (15th ed.). Cengage Au.
9. Boadu, S. K., Bannor, G. A., & Arthur, Y. D. (2023). Effects of Teaching Quality, Teaching Competence, and Mathematics Connection on Mathematics Achievement Motivation among Senior

High School Students in Ghana. *Matrix Science Mathematic,* 7(2), 63–68.DOI/URL: http://doi.org/10.26480/msmk.02.2023.63.68

10. Byrne, B. M. (2016). *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming* (3rd ed.). Routledge.DOI/URL: https://doi.org/10.4324/9781315757421
11. Caspi, A., & Gorsky, P. (2024). STEM career expectations across four diverse countries: Motivation to learn mathematics mediates the effects of gender and math classroom environments. International Journal of STEM Education, 11(1), Article 52. https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-024-00511-5
12. Caspi, A., Legewie, J., & Raabe, I. (2024). Students' interest and career expectations in STEM: The role of mathematics perceptions and classroom climate. Frontiers in Education, 9(2), 1-15.
13. Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.
14. Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE publications.
15. Davis, E. K., Abass, A. T., & Tikiwi, A. (2023). The attributes senior high school mathematics teachers and their students value in mathematics learning. SAGE Open, 13(2), 1-14. https://journals.sagepub.com/doi/full/10.1177/27527263231179745
16. Davis, E. K., Carr, M. E., & Ampadu, E. (2019). Valuing in mathematics learning amongst Ghanaian students: What does it look like across grade levels? In P. Clarkson, W. Seah, & J. Pang (Eds.), Values and Valuing in Mathematics Education (pp. 89–102). Springer. https://doi.org/10.1007/978-3-030-16892-6_6
17. Dehne, M., Nägele, C., & Trautwein, U. (2023). Utility-value change and the role of emotional cost in video-based learning. Frontiers in Psychology, 14, 1122334.
18. Dookurong, D. I. (2025). Cultural values and mathematical problem-solving in Ghana: The interplay of motivation and prior knowledge. Education Science & Management, 6(1).
19. Eccles, J. (2020). Expectancy-Value Theory (in: Eccles & Wigfield). In *Handbook of Motivation* (example entry).DOI/URL: https://psycnet.apa.org/
20. Gyasi, A. B., Yarhands Dissou, A., & Benjamin Adu, O. (2024). Effects of perceived mathematics connection on mathematics motivation: Mediating role of history of mathematics concepts. International Journal of Mathematics and Mathematics Education, 2(1), 1-14. https://journals.eduped.org/index.php/IJMME/article/view/898
21. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis* (8th ed.). Cengage/Pearson.DOI/URL: https://www.pearson.com/us/higher-education/program/Hair-Multivariate-Data-Analysis-8th-Edition/PGM334314.html
22. Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural Equation Modelling: Guidelines for Determining Model Fit. *Electronic Journal of Business Research Methods, 6*(1), 53–60.DOI/URL: https://academic-publishing.org/index.php/ejbrm/article/view/1224
23. Kline, R. B. (2023). *Principles and Practice of Structural Equation Modeling* (5th ed.). The Guilford Press.DOI/URL: https://www.guilford.com/books/Principles-and-Practice-of-Structural-Equation-Modeling/Rex-Kline/9781462551910
24. Krejcie, R. V., & Morgan, D. W. (1970). *Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607–610.* https://doi.org/10.1177/001316447003000308
25. Luo, J., Ahmad, S.F., Alyaemeni, A. *et al.* Role of perceived ease of use, usefulness, and financial strength on the adoption of health information systems: the moderating role of hospital size. *Humanit Soc Sci Commun* **11**, 516 (2024). https://doi.org/10.1057/s41599-024-02976-9
26. Mayerhofer, M., Lüftenegger, M., & Eichmair, M. (2024). The development of mathematics expectancy-value profiles during the secondary–tertiary transition into STEM fields. International Journal of STEM Education, 11(1), Article 31. https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-024-00491-6
27. Mayerhofer, M. (2023). Impact of a Mathematics Bridging Course on the Motivation and Learning Skills of University Students. (Preprint/working paper entry).DOI/URL: https://ucrisportal.univie.ac.at/en/publications/impact-of-a-mathematics-bridging-course-on-the-motivation-and-lea
28. Ministry of Education, Ghana. (2023). Ministry of Education Performance and Budget 2023.DOI/URL: https://mofep.gov.gh/sites/default/files/pbb-estimates/2023/2023-PBB-MOE.pdf

29. Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory* (3rd ed.). McGraw-Hill. DOI/URL:https://books.google.com/books/about/Psychometric_Theory.html?id=r0fuAAAAMAAJ
30. Ortiz-López, A., García-González, A., & Escamilla-Fajardo, P. (2024). Perceived usefulness of mobile devices in assessment: Evidence from higher education. Education and Information Technologies, 29(5), 5123–5142.
31. Sigus, H., Mädamürk, K (2025). Students' motivation as a mediator between extra-mathematical knowledge and word problem-solving. *Discov Educ* **4**, 172 https://doi.org/10.1007/s44217-025-00595-3
32. Tabachnick, B. G., & Fidell, L. S. (2019). *Using Multivariate Statistics* (7th ed.). Pearson.DOI/URL: https://www.pearson.com/en-us/subject-catalog/p/using-multivariate-statistics/P200000003097/9780134790541
33. Totonchi, D. A., Harackiewicz, J. M., & Hulleman, C. S. (2023). Improving community college students' success in math: Findings from two utility-value intervention studies. Community College Journal of Research and Practice, 47(10), 755–771. https://par.nsf.gov/servlets/purl/10526866
34. UNESCO. (2024). [Relevant UNESCO report on education and STEM inclusion — include specific title when needed].DOI/URL: https://www.unesco.org/
35. Wei Peng, Kathryn Robinson-Tay (2025). Assessing the characteristics and outcomes of perceived usefulness and ease of use for autonomous vehicle adoption. Transportation Research Part F: Traffic Psychology and Behaviour,Volume 111, Pages 391-408. https://doi.org/10.1016/j.trf.2025.03.014.
36. Wrigley-Asante, C., Ackah, C. G., & Frimpong, L. K. (2022). Career aspirations and influencing factors among male and female students studying Science, Technology, Engineering and Mathematics (STEM) subjects in Ghana. Ghana Journal of Geography, 14(1), 83-100. https://journals.ug.edu.gh/index.php/gjg/article/view/1683