Journal of Mathematics and Science Teacher
2023, 3(2), em039
e-ISSN: 2752-6054
https://www.mathsciteacher.com/

MODESTUM

Research Article

OPEN ACCESS

Mediation and moderation effects of motivation and teaching quality on the relationship between peer tutoring and mathematics achievement

Samuel Kwaku Boadu [1*], Yarhands Dissou Arthur [1], Ebenezer Bonyah [1]

[1] Department of Mathematics Education, Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development, Kumasi, GHANA
***Corresponding Author:** boadukwakusamuel@gmail.com

Citation: Boadu, S. K., Arthur, Y. D., & Bonyah, E. (2023). Mediation and moderation effects of motivation and teaching quality on the relationship between peer tutoring and mathematics achievement. *Journal of Mathematics and Science Teacher, 3*(2), em039. https://doi.org/10.29333/mathsciteacher/13166

ARTICLE INFO

Received: 07 Nov. 2022

Accepted: 30 Mar. 2023

ABSTRACT

Purpose: This study explored the mediation and moderation effects of motivation (M) and teaching quality (TQ) on the relationship between peer tutoring (PT) and mathematics achievement (MA).

Design/methodology/approach: The study adopted a descriptive survey, which comprised of 350 samples of students in Kumasi Senior High Technical School and Kumasi Academy Senior High School. Preliminary analyses, including confirmatory factor analysis, convergent validity, discriminant validity, and internal consistency (Cronbach's alpha) were estimated before the main model estimation. To test the various hypotheses, Amos (v.23) was used to do structural equation modelling.

Findings: The study concluded that PT partially mediate MA through M. TQ showed moderating effect on relationship between PT and MA. PT however, had significant positive effects on M.

Research limitations/implications: The researcher only looked at the mediation and moderation effects of M and TQ of the relationship between PT and MA in senior high schools. The study also relied on descriptive survey data, which may not be suitable for causal analysis. Future research should, however, consider longitudinal data.

Practical implication: The study informed teachers teaching mathematics and in other different programs to be equipped with knowledge of how students perceive mathematics so as to select the appropriate teaching approach to influence their interest and belief in the study of mathematics.

Originality/value: There are studies by some researchers combining these variables under study with other factors to influence students' achievement however, little attention was on the effect on PT on M.

Keywords: mathematics achievement, motivation, peer tutoring, teaching quality

INTRODUCTION

Background to the Study

The area of education has seen a considerable change in understanding about the nature of human knowledge and the environments that best encourage a variety of human learning dimensions (Applefield et al., 2001). According to multiple studies, humans learn best when they repeat the same behavior several times (Bryan et al., 2011; Jennifer, 2015; Kang, 2016). The new educational reform has resulted in a paradigm transformation in the approach of teaching from a teacher-centered to a learner-centered approach. With the shift in the teaching and learning paradigm, the ability of the teacher to take care of his or her own professional growth, as well as invent and deploy innovative teaching methods required for the development of students' competencies, has received a lot of attention (Marinko et al., 2015). Mathematics is a must pass subject, if a seinior high school graduate wants to enter into tertiary education. A graduate needs at least grade C6 in core mathematics, before they could gain admission into mainstream university degree courses. Statistics from the 2021 West African Senior School Certificate Examination (WASSCE) indicated that only 54.11% of graduates had from A1 to C6 when they sat for the examination. This percentage was less than the pass rate during 2020 WASSCE, which makes it a worrying situation. This present study identified some variables, which could be useful in salvaging the situation of poor performance in mathematics at the senior high schools (WAEC, 2021). The

This paper was engaged from Samuel Kwaku Boadu's thesis with the title "Mediation and moderation effect of motivation and teaching quality on the relationship between peer tutoring and mathematics achievement."

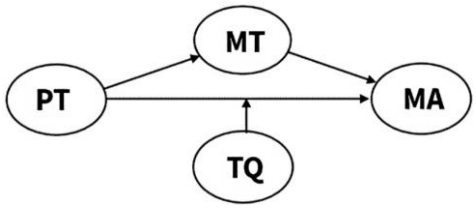

Figure 1. Conceptual framework (Source: Field Survey, 2022)

"constructivist learning theory," which emphasizes the learners' crucial role in generating meaning from new knowledge and existing experience, is the theory and practice that underpins this sort of learning. Constructivist learning theory is applicable to this study because in peer tutoring (PT), learners construct knowledge rather than just passively take in information. Student-centered learning emphases on skills and practices that promote lifelong learning and self-directed problem-solving (Young & Paterson, 2007).

The education community in Ghana encourages a shift away from traditional teaching approaches toward learner-centered teaching and learning methods that emphasize students' achievement, active knowledge production, retention, transfer of information, and problem solving. Critical thinking, active learner participation, and knowledge production are not promoted by traditional teaching methods. Giving pupils the opportunity to learn and study together is one way to accomplish this. Again, in order to provide effective instruction, a skilled mathematics teacher must employ learner-centered strategies and procedures. PT is one of many teaching strategies that, independent of class size or the diversity of learners in a class, has a favorable influence on students' achievement and retention of information. PT is a strategy for supportive learning centered on the formation of groups with a higher-level relationship, which is obtained from errands of their individual duties, guide, and tutee, where the two understudies have a collective goal and obtain curricular limits through an association set up by the educator (Topping et al., 2003).

According to Fenster (2014), highly effective teachers ensure long-term and short-term changes in students' intellectual learning. As a result, in any school setting, teacher quality is the most debatable issue in advancing student achievement and closing achievement gaps (Hachfeld & Lazarides, 2021). Motivation (M) is defined as natural needs that exist in a private situation or that are replicated in a private setting when obtaining new information and learning (Lin, 2012). Students who are motivated to learn mathematics, attentively follow lessons, check group discussions, learn extremely to accomplish their goals, induce higher scores, are desirous of learning at school, recognize the importance of math in other subjects, and attend school for all mathematics lessons are measured. M is one of the most important factors in student development and ensuring continual success (Cham et al., 2021). To combat this threat, effective teaching and learning methods must be implemented, with a focus on learners' achievement, critical thinking, and active knowledge production at the center of the teaching and learning process. M has a considerable impact on the students' learning achievements (Ikhlas et al., 2021). In appreciation of these uncertain discoveries, the researcher considered adding to existing literary works the mediating and moderating effects of M and teaching quality (TQ) on the relationship between PT among students and achievement in mathematics, which is an identified gap and inconsequential within the checked literary works. Based on the approach, this study is among a few existing works, which made use of structural equation model (SEM). Hence, the main objective is to find out the mediation and moderation effects of M and TQ on the relationship PT and mathematics achievement (MA).

Hypotheses Development

PT method of learning is related with social constructivism since students use their own knowledge to help each other with tasks and class appraisals (Summers, 2006). M is defined as the instinctive and thinking processes by which individuals pursue to fulfill the basic, perceived and individual objectives needs that drive human activity (Cole, 2004). TQ refers to tutoring techniques that satisfy students' needs for autonomy (a sense of self-determination and independence from control), competence (a sense of efficiency and confidence in social interactions), and relatedness (a sense of being connected to and saved by others). MA was impacted by various components, including PT, TQ, and M, which are often not independent. M serves as the mediation role of the relationship between PT and MA. TQ also serves as the moderation role of the relationship between PT and MA. **Figure 1** depicts the conceptual framework linkages between the variables influencing math achievement.

Theoretical Framework

The current study explored the mediation and moderation effects of M and TQ on the relationship between PT and MA. We hypothesized the relationship between PT, TQ, and M on MA. The empirical evidence has been divided into four categories based on the stated relationships on the basis of the research questions established on the variables under the study i.e., PT, TQ, M, and MA. The current research was based on the following theories: constructivist learning theory, collaborative learning theory, and social learning theory.

H1: Peer tutoring has a direct positive effect on motivation

Several studies have shown that M is an important aspect of mathematical success (Cleary et al., 2017).

Students who achieve well frequently have a high level of M to attain goals and therefore put a lot of effort into learning. When students are highly motivated, their anxiety levels decrease, and their self-esteem increases. Enthusiastic students are more focused and good at mathematics because they are more likely to persevere, even when mathematical concepts are challenging.

The results also showed that students were motivated to achieve their own mathematical success (Arroyo et al., 2014). Students are likely to be more motivated when they understand the importance of the task. Involving peer tutors in the learning process can improve students' M and ultimately lead to better mathematical success. Peer tutors were able to motivate students and believed that student M increased through tutorials (Roberts, 2019). For this reason, PT can be considered a useful intervention strategy to help respond to student M. This finding is similar to that of Chue and Nie (2017), who say that students should be encouraged to work to ensure that various learning methods, such as tutorials, can influence success and enthusiasm. Topping et al. (2015) confirmed that peer learning naturally motivates the student and promotes socially shared cognition and pee learning.

H2: Motivation mediates the relationship between peer tutoring and mathematics achievement

Intrinsic M of mathematics mediates the high-impact relationship between PT and mathematical performance (Froiland & Davison, 2016). The results of this study suggest that M mediate PT and MA. This is consistent with some previous studies. Austin (2008) also supports the finding that PT is beneficial for improving student M. When students are involved in a task, they have a greater knowledge of the content taught. Students are likely to be more motivated when they understand the relevance of the task. The writer therefore claims that when students believe that they are ready for mathematical tasks, students' M increases. Involving peer tutors in the learning process can improve students' M and ultimately lead to better mathematical success. This was supported by Roberts (2019), who reported that peer tutors were able to motivate students and believed that student M improved through discussion group. Thus, PT can be considered a useful intervention strategy to help respond to student M.

H3: Teaching quality has a moderation effect on peer tutoring and mathematics achievement

TQ has been demonstrated to be a multifaceted event, with little agreement on how to define and measure it (Seidel & Shawlson, 2007). To be effective in the classroom, various explanations of types of teaching preparation and knowledge include what should be imparted to learners and how information should be passed on (Darling-Hammond, 2000). Recent research on TQ emphasized how teachers' involvement in student academic progress varies depending on several variables such as teachers' academic and professional backgrounds, classroom practices, and years of experience. Countries must be compelled to look rigorously at how teacher-student relationships can be established so that meaningful conclusions can be framed and plans to further develop learners' achievement can be laid out. Researchers have looked into the moderation effect of TQ on PT to enhance student achievement (Hachfeld & Lazarides 2021; Williams, 2021). It is possible that for students, PT dimensions may be more useful than teaching development measurements such as general curriculum arrangement, and that when there is a significant degree of TQ by peers, it will result in higher MAs. According to Arthur et al. (2017) and Fauth et al. (2019), TQ has a significant impact on student achievement. The observational writing examining indicators of students' interest and achievement has resolved the issue of TQ effect by estimating the effect of distinctive teacher factors and the effect of general TQ Lazarides and Buchholz (2019). Furthermore, experimental studies that link TQ and student success are limited to a few researchers in the United States. Few reports and writings have examined TQ attributes associated with higher learner achievement in various countries, most notably Ghana (Arthur, 2019; Arthur et al., 2017).

Several precise studies conducted by researchers in the United States have identified characteristics of teacher quality that are associated with higher student achievement. According to Knight (2012), two types of reviewed writings have been led to focus on the effect of TQ as

(i) focuses on that examined variety in educator impacts by estimating contrasts between classes in achievement gains after controlling for foundation qualities (Hanushek & Rivkin, 2006) and
(ii) relapse focuses on that investigated the relationship between instructor qualities and understudy accomplishment after controlling for foundation attributes (Zuzovsky & Donitsa-Schmidt, 2017).

Regardless, the findings have been deemed insignificant and inconsistent. Long stretches of demonstrating teaching experience are clearly and fundamentally related to student success in Taiwan. This supports Monk (2007), findings that long periods of involvement with students to gain experience have a positive relationship. In a similar case, we discovered no connection between these same variables in context. This finding is consistent with (Zuzovsky & Donitsa-Schmidt, 2015), who saw as only peripheral and measurably inconsistent beneficial outcomes of teacher experience on learner success in mathematics and science. Teacher pedagogical readiness is yet another indicator of TQ. It was consistently answered to have an impact on learner achievement (Metzler & Woessmann, 2010). Findings revealed that TQ had significant positive effect on MA (Arthur et al., 2022). The quality of education depends on unique instructor behaviors that support students' aspirations for autonomy (a sense of self-dedication and independence from manage), competence (a feel of efficiency and self-belief in social interactions), and relatedness (a feel of belonging) (Kelcey et al., 2019).

METHODOLOGY

Research Design

A research design's objective is to specify a strategy for accumulating empirical data to address the study's issues (McMillan & Schumacher, 2006). The research design for the study was a descriptive survey. When a sample of participants is given a questionnaire at a certain time to characterize their views, opinions, actions, perceptions, or qualities, the research design is said to be descriptive (Creswell, 2012).

Table 1. Demographics of students

Demographics	Frequency (n)	Percentages (%)
Gender	**350**	**100.0**
Male	195	55.7
Female	155	44.3
Age	**350**	**100.0**
11-15 years	58	16.6
16-20 years	267	76.3
21-25years	22	6.3
Above 25 years	3	0.9
Form	**350**	**100.0**
Form 1	216	61.7
Form 2	134	38.3
Education level of parents	**350**	**100.0**
Basic level	154	44.0
Secondary level	116	33.1
Tertiary level	80	22.9

Sample, Sampling Technique, and Data Collection

The study obtained data from 350 students at Kumasi Senior High Technical School and Kumasi Academy Senior High School in Ghana's Ashanti Region. These students took mathematics as a core subject as part of their academic requirements. The students chosen were from SHS 1 and SHS 2 with 195 males and 155 females. The number of samples chosen for the study is consistent with Yamane's (1973) recommendation, who provided a formula for determining the appropriate sample size for any survey design. The data collection tool was a structured questionnaire, and the data was collected over a four-week period. This is illustrated, as follows:

$$n = \frac{N}{1+Ne^2},$$

where n is sample size, N is population size, which is 2,770, and e is error (0.05) confidence level 95%.

$$n = \frac{2{,}770}{1+(2{,}770)(0.05)^2} = 350.$$

The study made use of two sampling techniques, which were stratified and simple random sampling techniques. Stratified sampling technique was applied to group the members of a population into homogeneous sub-group consisting of home economics, visual arts, business, general arts, and technical and general science. In the sample selection process, simple random sampling technique was employed to select some students who were available at classrooms when the collection of the data was done and that each individual was chosen at random rather than based on bias.

Questionnaire and Measures

The study focused on the mediation and moderation effects of M and TQ on the relationship between PT and MA. The researcher developed the research questions in two parts with part A as socio- demographic data and part B based on the four variables being studied. The part B was measured based on 5-Likert scale grading from 1 (strongly disagree) to 5 (strongly agree). There were three independent variables (PT, TQ, and M) with MA as the dependent variable. Based on the four constructs, there were 37 measurement items. Students' age, gender, educational level of parents and form were also accounted for in the study. A letter was issued to the selected SHS schools requesting permission to perform the study. The privacy and anonymity of the participants were respected. **Appendix A** shows the questionnaire.

From **Table 1**, The response indicates that, out of the 350 students who participated in this study, 195 students were male representing 55.7% and 155 were female representing 44.3%. The age limits of 11-15 years were 58 respondents representing 16.6%, 16-20 years were 267 respondents representing 76.3%, 22 respondents were 21-25 years representing 6.3%, and three respondents were above 25 years, which represents 0.9%. The respondents were Kumasi SHS and Kumasi Academy SHS with 216 students in SHS 1 representing 61.7%, 134 students in SHS 2 representing 38.3%. The results of the respondents' educational level of their parents' show that 154 were at a basic level representing 44.0%, 116 were at a secondary level representing 33.1% and finally, 80 were at tertiary level, which represents 22.9%.

Reliability Analysis

Instruments used in quantitative research are subjected to a comprehensive evaluation and statistical analysis in order to determine their validity and reliability. The degree to which a measure accurately reflects the concept under consideration is called validity. This is accomplished through a panel or judge's judgment (Joppe, 2000). Reliability refers to how well a measurement produces consistent results throughout time and even when utilized by various researchers. The measurement items, although selected from previous studies, were adjusted to match this study. The study was also pilot tested and reformulated ambiguous claims and bad factor loading for some constructs due to ambiguity in some statements (measurement items) was identified and removed. Reliability analysis was performed using the Cronbach's alpha coefficient for the internal consistency of the main variables studied. PT had a Cronbach's alpha score of 0.853, M had a Cronbach's alpha score of 0.709, TQ had a Cronbach's alpha score of 0.794, and MA had an alpha score of 0.758. The reliability of the observed variables is achieved if a Cronbach's alpha score is at least 0.7, which is considered quite respectable for establishing the appropriateness of an instrument, hence this coefficient was deemed high enough to support its usage in the study (De Veilis, 1991).

Table 2. Descriptive analysis

Variables	ME	SD
Peer tutoring	**4.033**	**0.186**
Peer tutoring provides the learners an opportunity to enhance their social and behavioral abilities, including communicating, sharing, & cooperating with each other in the classroom.	4.050	0.227
Peer tutoring techniques are successful & effective for high school students with learning disabilities.	4.030	0.182
Peer tutoring helped weak students to make active participants of the class.	4.020	0.150
Mathematics achievement	**4.028**	**0.238**
I participate in maths class during peer tutoring to get a good grade.	4.020	0.220
I participate in maths class during peer tutoring to perform better than other students as compared to normal class.	4.020	0.130
Small group discussion improves my understanding of mathematics.	4.070	0.352
Students achieve their academic goals & improve their social relations all together.	4.000	0.251
Teaching quality	**4.067**	**0.249**
The peer teaching staff work hard to make their subjects interesting.	4.100	0.300
Support to student learning (initiatives helping students to work efficiently).	4.040	0.203
Support to teaching and learning environment (libraries, computing facilities, & virtual learning environment).	4.060	0.243
Motivation	**4.060**	**0.430**
Female teachers are better motivated than male teachers.	4.020	0.362
Financial incentives motivate me more than non-financial incentives.	4.070	0.630
I can explain the things that I learned in my own words in mathematics subject.	4.090	0.298

Note. ME: Mean & SD: Standard deviation

Table 3. Exploratory factor analysis

Measurement items	Components			
	1	2	3	4
PT5	.860			
PT7	.911			
PT9	.816			
MA5		.893		
MA6		.687		
MA7		.733		
MA9		.775		
TQ4				.810
TQ5				.873
TQ6				.833
MO2			.658	
MO3			.884	
MO6			.793	
Total variance explained				70.428%
Kaiser-Meyer-Olkin measure of sampling adequacy				.726
Bartlett's test of sphericity			Approximate Chi-square	2,035.644
			df	78
			Sig.	.000
a. Determinant				.003

Note. Extraction method: Principal component analysis; Rotation method: Varimax with Kaiser normalization; & Rotation converged in 5 iterations

DESCRIPTIVE ANALYSIS

The study also employed descriptive analysis. This was used to test its normality on the questionnaire using mean and standard deviation. The results based on each construct items were presented in **Table 2**. While TQ had the highest mean score of 4.067, MA had the least mean score of 4.028. The mean and standard deviation on each construct showed that there was a satisfactory normality test

Exploratory Factor Analysis

The variable reduction technique that identifies the number of latent constructs and the factors that underlie the structure of a set of variables is exploratory factor analysis (EFA) (Suhr, 2005). EFA was used to determined how each of the observed variables loaded on their respective latent variables. Kaiser-Meyer-Olkin measure of sampling adequacy was 0.726, which was greater than 0.5. As this is an exemplary value, it shows that there is a solid connection between all of the items (Hair et al., 2010). The Bartlett's sphericity test was significant with a value of p=0.000, showing that there was enough correlation to permit factor analysis and a Chi-square value of 2,035.644 with 78 levels of degree of freedom. The researcher performed a factor analysis to decide the number of factors to be extracted. A total of four factors were extracted and rotated, and the cumulative variance explained was 70.428% with a determinant of 0.003 (**Table 3**). Items with issues of poor factor loadings were taken out iteratively and the fit indices were analyzed each time an item was erased.

Table 4. Confirmatory factor analysis

Model fit indices: CMIN=171.825; df=59; CMIN/df=2.912; CFI=.943; TLI=.925; RMR=.003; RMSEA=.074; p-close=.052; GFI=.943; AGFI=.891; & NFI =0.917	**SFL**
Peer tutoring (PT): CA=0.853; CR=0.903; & AVE=0.757	
(PT5) Peer tutoring provides the learners an opportunity to enhance their social and behavioral abilities, including communicating, sharing and cooperating with each other in the classroom	0.79
(PT7) Peer tutoring techniques are successful and effective for high school students with learning disabilities	0.99
(PT9) Peer tutoring helped weak students to make active participants of the class	0.71
Mathematics achievement (MA): CA=0.758; CR=0.857; & AVE=0.602	
(MA5) I participate in maths class during peer tutoring to get a good grade	0.95
(MA6) I participate in maths class during peer tutoring to perform better than other students as compared to normal class	0.61
(MA7) Small group discussion improves my understanding of mathematics	0.64
(MA9) Students achieve their academic goals and improve their social relations all together	0.65
Teaching quality (TQ): CA=0.794; CR=0.877; & AVE=0.704	
(TQ4) The peer teaching staff work hard to make their subjects interesting	0.64
(TQ5) Support to student learning (initiatives helping students to work efficiently)	1.00
(TQ6) Support to teaching and learning environment (libraries, computing facilities, virtual learning environment)	0.70
Motivation (M): CA=0.709; CR=0.807; & AVE=0.586	
(M2) Female teachers are better motivated than male teachers	0.60
(M3) Financial incentives motivates me more than non-financial incentives	0.89
(M6) I can explain the things I learned in my own words in mathematics subject	0.75

Note. SFL: Standard factor loading

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) permits researchers to test the hypothesis concerning whether there is or is not a relationship between the variables examined and the burden factor.

Researchers use theoretical knowledge, empirical research, or both to ascertain a priority relationship pattern, and then, the hypothesis is tested using the statistical method (Hair et al., 2010). The study used Amos (v.23) to do CFA as part of the reliability and validity assessment. CFA measures how well the data fit into the study model. The use of CFA in numerous related works confirms that it has more applications than other statistical analyses. This is due to CFA's ability to estimate a number of statistical tests. (Dogbe et al., 2020; Lahey et al., 2012). CFA method was adopted by the researcher due to its benefits, as demonstrated by (Lahey et al., 2012). First, it permits statistical testing of many aspects of hypothesis models. Secondly, CFA offers statistical information on the level and origin of inappropriate models, which is used to further modify the model. Also, CFA estimates that the difference in error variance is different from the unexplained variance in the underlying constructs, with small errors in the measurement of latent variables compared to the areas of interest that characterize the network. Finally, CFA allows assessment of competing models with a combination of analytical data constraints. CFA results are shown in **Table 4** and within the method of CFA, there were observed variables with bad factor loadings (less than 0.5), which were excluded from further analysis.

Initially, PT, TQ, and M had nine measurement items and MA had ten measurement items. M had nine measurement items, and TQ had nine measurement items. Following CFA process, six of each of the observed variables in PT, M, TQ, and MA were eliminated. Another key factor to consider when running CFA is the model's fitness. As reported CMIN/df should be less than three, CFI and TLI should be at least 0.9, RMR and RMSEA should be at least 0.8, while p-close should also be greater than 0.05 (Hair et al., 2010). CMIN measures minimal inconsistency in the model; RMR and RMSEA represent perfectly identical indices by evaluating the deviation of the hypothesis model from the perfect model; while CFI and TLI represent incremental agreement indices by comparing how well the hypothesis model fits the baseline model (evaluating least agreement) (Xia & Yang, 2019). The limit values for CFI and TLI are based on the maximum probabilities of normal continuous data theory. These were all achieved as presented in **Table 4**.

The value generated by the CFI was equal to 0.943, which was greater than 0.90, which means that this model was valid and had a high correlation between the model and the data. The resulting GFI value was 0.943. This means that the resulting model was good. In addition, the resulting RMSEA value was 0.074; this was less than 0.08, which means an acceptable value for RMSEA. This shows that the basic factors of the four constructs were valid and acceptable. NFI and TLI values were 0.917 and 0.925 respectively, which were also above 0.9 indicating very good fit for the 4-factor model. As part of the fitness assessments, CMIN/df value was 2.912, which was less than three and the p-close value of 0.052 indicated statistically insignificant at 5% (Hair et al., 2010). **Figure 2** shows diagrammatic presentation of CFA.

Discriminant Validity

As in previous studies such as Bamfo et al. (2018), this study examined discriminant validity (DV) by comparing the square root of average extracted variance (AVE) to the correlation coefficients. DV measures the degree to which measurement items are uncorrelated to measurement items in different constructs (Trochim & Donnelly, 2001). DV is achieved when the smallest √AVE is greater than the largest correlation coefficient (Arthur et al., 2021). As shown in **Table 5**, the smallest √AVE value was 0.530, while 0.36 showed the highest correlation coefficient. Therefore, this DV was achieved on the dataset. AVE and composite reliability for all constructs met the corresponding thresholds, indicating that convergent validity was attained in this study (Fornell & Larker, 1981). The results indicated that 0.530 of MA was the least AVE.

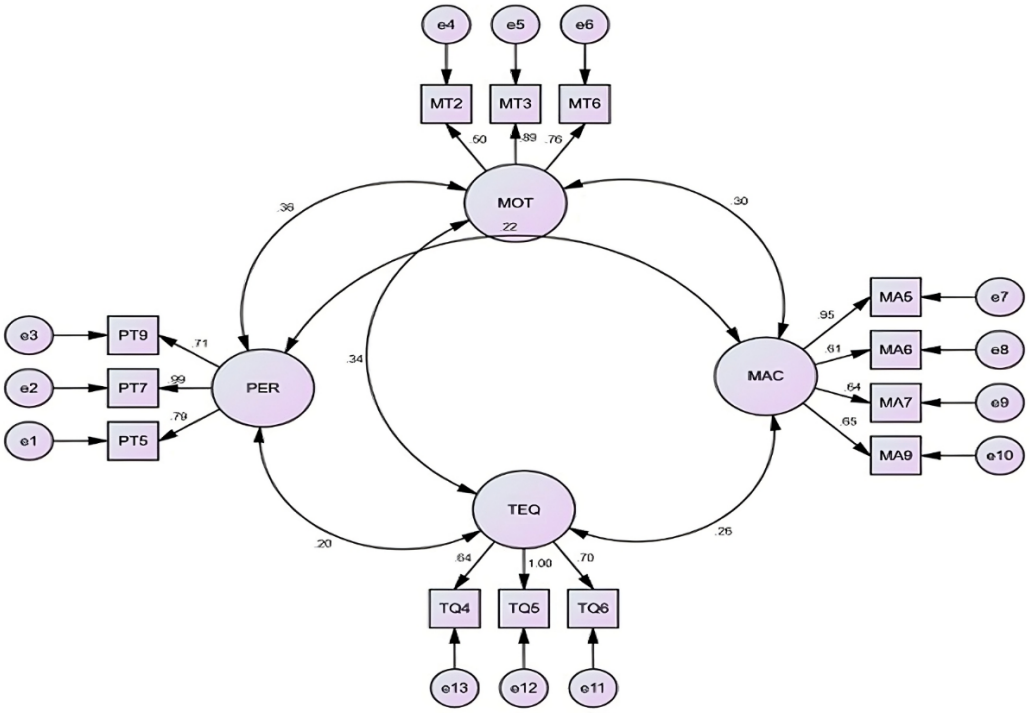

Figure 2. Diagrammatic presentation of CFA (Source: Field Survey, 2022)

Table 5. Discriminant validity

Variables	PT	TQ	MT	MA
PT	**0.706**			
MT	0.360**	**0.539**		
TQ	0.200**	0.340**	**0.631**	
MA	0.220**	0.300**	0.260**	**0.530**

Note. **~p-value significant at 1% (0.01) & √AVE are **bold** & underlined

PATH ESTIMATES

Direct Effect

Path analysis is a strategy of decomposing covariations or correlations between two variables in a model of structural equations to determine how much of this covariance is caused by a theoretically indicated causal effect of one variable on another. The results of the direct effects of the control variables (age, gender and form), the independent variables (PT, TQ, and M) against the dependent variable (MA) are presented in **Table 6**. Students' form had a negative value, which was statistically insignificant on the impact MA of students' (β=-0.53; CR=-2.324; p-value=0.20).

This means that the finding was rejected with form having no effect on MA of students. Gender also had a strong positive impact on MA (β=0.15; CR=0.669; p-value=0.504). The outcome showed that male students around 15% were more plausible than female students who excel in mathematics. Age, the final control variable, had a negative but statistically insignificant effect on MA (β=-0.11; CR=-4.84; p-value=0.628). This means that the finding was rejected, despite the fact that older students achieved worse in mathematics.

SEM was run by Amos (v.23) to measure the different paths hypothesized in the study. The bias-corrected (BC) percentile bootstrap method was used with 5,000 bootstrap samples and 95% confidence levels. The study ascertained that PT had a direct positive impact on M (β=0.349; CR=5.140). Thus, about a 34% increase in PT as a teaching strategy when senior high school (SHS) students are fully motivated. The finding agrees with the study by McMaster et al. (2006) who showed that M is another benefit of using peer learning to stimulate students' learning in math classes. *H1: Peer tutoring has a direct positive effect on motivation* was thus confirmed.

Table 6. Path estimates

Direct paths	Unstandardized estimate	CR	SE	p-value
AGE→MAC	-0.110	-4.840	0.220	0.628
FORM→MAC	-0.530	-2.324	0.230	0.200
GENDER→MAC	0.150	0.669	0.220	0.504
PER→MOT	0.349	5.140	0.680	***

Note. Model fit indices: CMIN=460.905; df=217; CMIN/df=2.124; CFI=.929; TLI=.921; RMR=.034; RMSEA=.061; p-close=.079; & **~p-value significant at 1% (0.01) & *&~p-value significant at 5% (0.05)

Table 7. Mediating effect

Paths	Direct effect		Indirect paths				Indirect effect (a*b)	Sobel's test
			A		B			
	Estimate	CR	Estimate	CR	Estimate	CR		
PER→MOT→MAC	0.144	2.125	0.349	5.140**	0.250	3.305**	0.087	0.325**

Note. **Significant at 1%; $Z = \frac{axb}{SE_{ab}}$; & $SE_{ab} = \sqrt{(SE_a)^2 xb^2 + (SE_b)^2 xa^2}$

Table 8. Moderating effect

	Estimate	SE	CR	p-value
MAC<--- PER	.161	.070	2.298	.022
MAC<---TEQ	.211	.072	2.910	.004
MAC<--PTxTQ	.012	.006	2.168	.030

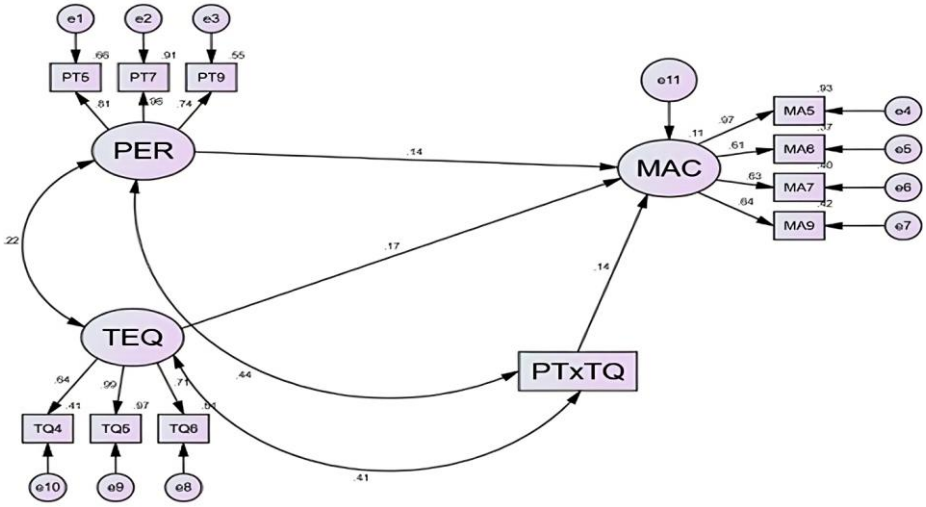

Figure 3. Moderation structural paths (Source: Field Survey, 2022)

The study also estimated the mediation effect of M as another hypothesis path analysis and moderation effect of TQ between PT and MA. The indirect effect was calculated using SEM from Amos (v.23), this was estimated from the matrix indirect effect and the value was reported to be 0.087, which was greater than 0.05 indicating statistically insignificant at 5% (**Table 7**). The results showed that M partially mediated the connection between PT and MA in SHSs. Sobel's test was also used to calculate whether the mediator variable (M) significantly carries the influence of the independent variable (PT) on the dependent variable (MA). That is if the indirect effect of the independent variable by the mediator variable is significant. The reported test statistics were taken from the unit normal distribution under the assumptions of a two-tailed Z hypothesis test. The z-scores of plus (+) or minus (-) 1.96 are the critical values of the test ratio, which contain the central 95% of the unit normal distribution. This conclusion was obtained by comparing the z- score from Sobel's test with the critical value from a 95% confidence interval. Since the Sobel test gave a value of 0.325, which was less than 1.96 (z<1.96), it shows statistically insignificant, and that PT and MA through M was partially mediated.

Table 7 supports the explanation of the Sobel test. The study affirmed with Froiland and Davison (2016) who found intrinsic M of mathematics mediates the high-impact relationship between PT and mathematical performance. *H2: Motivation mediates the relationship between peer tutoring and mathematics achievement* was thus confirmed.

The moderation effect of TQ on MA had a p-value of 0.004, which was statistically significant at 5%. The interaction variables consisting of PT and TQ on MA was 0.030, which was less than 0.05 and hence the interaction variable (TQ) on MA was statistically significant (**Table 8**). *H3: Teaching quality has a moderation effect on peer tutoring and mathematics achievement* was thus confirmed. The finding agrees with Kelcey et al. (2019) who concluded that teacher mathematical knowledge and TQ influenced students' success. **Figure 3** depicts the moderation structural paths.

DISCUSSION

The method of PT as a teaching and learning strategy is enormously effective at enlightening students' knowledge of mathematics subjects, as students perform much better, as showed by their grades, and it builds trust, allowing them to work together and share their ideas (Alzaabi et al., 2021; Bozzi et al., 2021). The findings of this study suggest that PT has a significant effect on M of high school students This is consistent with some previous studies. Austin (2008) also supports the finding that PT is beneficial for improving student M. Involving peer tutors in the learning process can improve students' M and ultimately lead to better mathematical success. For this reason, PT can be considered a useful intervention strategy to help respond to student M. Peer-learning motivates the student in a natural way and promotes socially shared cognition and pee learning (Topping et al., 2015).

The study also examined the mediating effect of M between PT and MA. This was supported by the analysis of the coefficient for the indirect effect of PT on MA through M (PER→MOT→MAC). The indirect effect value of 0.0807 appears to be statistically insignificant (because low and high BCs were positive). However, this represents a partial mediating effect, as M had a direct positive effect on pupils' mathematical success. The results of this study showed that M partially mediate the relationship between PT and MA. Other studies that are in conformity with the current study include (Froiland & Davison, 2016; Li et al., 2020; Smith et al., 2012). In a longitudinal study, the effect of PT on MA, found that the intrinsic M of mathematics mediates the high-impact relationship between PT and mathematical performance (Froiland & Davison, 2016). The effect of age relationships on mathematical success in Zhuang adolescents recognized that M mediates the connection between peer education and mathematical success. Thus, the connection between PT and success in mathematics may not be as straightforward as some previous studies have suggested (Li et al., 2020). M stimulates students' interest in diverse academic subjects, and it is consequently clear that M builds students interest in getting to know mathematics (Smith et al., 2012).

This current study contributes to existing knowledge by presenting M as a mediating variable of the relationship between PT and mathematical achievement. Another important factor of the study was that the effect of PT and mathematical achievement was moderated by TQ.

CONCLUSIONS

The study concluded that PT had direct positive effect on M. The study also found that the effect of PT and MA were partially mediated by M. Finally, the relationship between PT and MA were moderated by TQ, which had a significant impact on MA.

Recommendations

Teachers should accept PT as a teaching approach on the way to improve students' performance in mathematics through direct participation. Students should be put into groups and be made to teach each other during free periods or when teachers are absent from school, which will help to improve their performance. Finally, M is a driving force, which also affects students' performance in mathematics. Students must therefore be motivated and encouraged to study mathematics.

Limitations and Future Research Suggestions

The study's findings cannot be extrapolated to other regions of the nation in order to reflect student achievement because it was only conducted in the Kumasi Metropolis. Only two schools participated in the study, so more would have been able to provide a more accurate description of the nature of students' approaches to mathematics study. No attempt was made to extrapolate the findings outside the parameters of this study in light of this. Future research should, however, consider longitudinal data.

Author contributions: All authors have sufficiently contributed to the study and agreed with the results and conclusions.

Funding: No funding source is reported for this study.

Acknowledgements: The authors would like to thank the anonymous reviewers for their comments and suggestions. The authors also would like to thank the anonymous reviewers for their efforts to improve the quality and presentation of this work.

Ethical statement: The authors stated that the study was the first author's thesis, which was approved by the graduate school of Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development, Kumasi, Ghana. A letter was issued to the selected senior high schools requesting permission to perform the study. The privacy and anonymity of the participants were respected.

Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

REFERENCES

Alzaabi, S., Khamis, A. H., Mascarenhas, S., Nasaif, M., Otaki, F., & Zary, N. (2021). Medical students' perception and perceived value of peer learning in undergraduate clinical skill development and assessment: Mixed methods study. *JMIR Medical Education, 7*(3), 1-12. https://doi.org/10.2196/25875

Applefield, M. J., Huber, R., & Moallem, M. (2001). Constructivism in theory and practice: Toward a better understanding. *The High School Journal, 84*(2), 35-53. https://www.jstor.org/stable/40364404

Arroyo, I., Burelson, W., Muldner, K., Rai, D., Tai, M., & Woolf, B.P. (2014). A multimedia adaptive tutoring system for mathematics that addresses cognition, metacognition and affect. *International Journal of Artificial Intelligence in Education, 24*(4), 387-426. https://doi.org/10.1007/s40593-014-0023-y

Arthur, Y. D. (2019). Effect of the constructivists teaching method, undergraduate students' statistics self-concept, and other psychological constructs in mediating their motivation for learning statistics. *African Journal of Educational Studies in Mathematics and Sciences, 15*(1), 129-142. https://doi.org/10.1016/j.heliyon.2019.e02491

Arthur, Y. D., Asiedu-Addo, S., & Assuah, C. (2017). Students' perception and its impact on Ghanaian students' interest in mathematics: Multivariate statistical analytical approach. *Asian Research Journal of Mathematics, 4*(2), 1-12. https://doi.org/10.9734/arjom/2017/33023

Arthur, Y. D., Boadu, S. K., & Asare, B. (2022). Effects of peer tutoring, teaching quality and motivation on mathematics achievement in senior high schools. *International Journal of Educational Sciences, 37*(1-3), 35-43. https://doi.org/10.31901/24566322.2022/37.1-3.1221

Arthur, Y. D., Dogbe, C. S. K., & Asiedu-Addo, S. K. (2021). Modelling students' mathematics achievement and performance through teaching quality: SERVQUAL perspective. *Journal of Applied Research in Higher Education*, ahead-of-print. https://doi.org/10.1108/JARHE-06-2021-0243

Austin, J. (2008). *The effects of peer tutoring on fifth-grade students' motivation and learning in math* [Master thesis, State University of New York]. http://hdl.handle.net/20.500.12648/5420

Bamfo, B. A., Dogbe, C. S. K., & Mingle, H. (2018). Abusive customer behavior and frontline employee turnover intentions in the banking industry: The mediating role of employee satisfaction. *Cogent Business and Management, 5*(1), 1-15. https://doi.org/10.1080/23311975.2018.1522753

Bozzi, M., Raffaghelli, J. E., & Zani, M. (2021). Peer learning as a key component of an integrated teaching method: Overcoming the complexities of physics teaching in large size classes. *Education Sciences, 11*(2), 67. https://doi.org/10.3390/educsci11020067

Chue, K. L., & Nie, Y. (2017). Study orchestrations and motivational differences in a mathematical context. *Learning and Individual Differences, 57*, 77-84. https://doi.org/10.1016/j.lindif.2017.06.002

Cleary, T., Schnaidman, B., & Velardi, B. (2017). Effects of the self-regulation empowerment program on middle school students' strategic skills, self-efficacy, and mathematics achievement. *Journal of School Psychology, 64*, 28-42. https://doi.org/10.1016/j.jsp.2017.04.004

Cole, G. A. (2004). *Management theory and practice*. Thomson Learning.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Pearson/Merrill Prentice Hall.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives, 8*, 1. https://doi.org/10.14507/epaa.v8n1.2000

De vellis, R. F. (1991). *Scale development: Theory and applications* (3rd edn.). London. https://doi.org/10.1108/01437730510633692

Dogbe, C. S. K., Tian, H., Pomegbe, W. W. K., Sarsah, S. A., & Otoo, C. O. A. (2020). Effect of network embeddedness on innovation performance of small and medium-sized enterprises. *Journal of Strategy and Management, 13*(2), 181-197. https://doi.org/10.1108/JSMA-07-2019-0126

Fauth, B., Decristan, J., Decker, A. T., Buettner, G., Hardy, I., Klieme, E., & Kunter, M. (2019). The effects of teacher competence on student outcomes in elementary science education: The mediating role of teaching quality. *Teaching and Teacher Education, 86*, 102882. https://doi.org/10.1016/j.tate.2019.102882

Fenster, E. D. (2014). *Implications of teacher tenure on teacher quality and student performance* [Unpublished honors thesis]. Duke University. http://content.time.com/time/nation/article/0,8599,1859505,00.html

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50. https://doi.org/10.1177/002224378101800104

Froiland, J. M., & Davison, M. L. (2016). The longitudinal influences of peers, parents, motivation, and mathematics course-taking on high school math achievement. *Learning and Individual Differences, 50*, 252-259. https://doi.org/10.1016/j.lindif.2016.07.012

Hachfeld, A., & Lazarides, R. (2021). The relation between teachers self-reported individualization and student-perceived teaching quality in linguistically heterogeneous classes: an exploratory study. *European Journal of Psychology of Education, 36*(4), 1159-1179. https://doi.org/10.1007/s10212-020-00501-5

Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). *Multivariate data analysis: A global perspective*. Pearson Education. https://doi.org/10.13140/RG.2.2.16621.26084/2

Hanushek, E. A., & Rivkin, S. G. (2006). Teacher quality. In *Handbook of the economics of education* (pp. 1051-1078). Elsevier. https://doi.org/10.1016/S1574-0692(06)02018-6

Horst, J. S., Parsons, K. L., & Bryan, N. M. (2011). Get the story straight: Contextual repetition promotes word learning from storybooks. *Frontiers in Psychology, 2*, 17. https://doi.org/10.3389/fpsyg.2011.00017

Hosen, M., Ogbeibu, S., Giridharan, B., Cham, T. H., Lim, W. M., & Paul, J. (2021). Individual motivation and social media influence on student knowledge sharing and learning performance: Evidence from an emerging economy. *Computers & Education*, *172*, 104262. https://doi.org/10.1016/j.compedu.2021.104262

Ikhlas, M., Hartina, S., & Kuswanto, K. (2021). Do motivation, self-regulation, and interest predict student performance in physics? A case study in one of Indonesian rural high school. *International Journal of Teaching and Case Studies, 12*(4), 332-354. https://doi.org/10.1504/IJTCS.2021.119657

Jennifer (2015). *Practice does make perfect learning through repetition*. Zurapps. https://zurapps.com/all/index.php/practice-does-make-perfect-learning-through-repetition/

Joppe, M (2000). *The research process*. http://www.ryerson.ca/~mjoppe/rp.htm

Kang, K. (2016). Special repetition promotes efficient and effective learning: Policy implications for instruction. *Behavioral and Brain Science, 3*(1), 12-19. https://doi.org/10.1177/2372732215624708

Kelcey, B., Chin, M. J., & Hill, H. C. (2019). Teacher mathematical knowledge, instructional quality, and student outcomes: A multilevel quantile mediation analysis. *School Effectiveness and School Improvement, 30*(4), 398-431. https://doi.org/10.1080/09243453.2019.1570944

Knight, S. L. (2012). Evaluation of teacher quality. In C. Secolsky, & D. B. Denison (Eds.), *Handbook on measurement, assessment, and evaluation in higher education* (pp. 602-610). Routledge. https://doi.org/10.4324/9780203142189-57

Lahey, B. B., McNealy, K., Knodt, A., Zald, D. H., Sporns, O., Manuck, S. B., Flory, J. D., Applegate, B., Rathouz, P. J., & Hariri, A. R. (2012). Using confirmatory factor analysis to measure contemporaneous activation of defined neuronal networks in functional magnetic resonance imaging. *Neuroimage, 60*(4), 1982-1991. https://doi.org/10.1016/j.neuroimage.2012.02.002

Lazarides, R., & Buchholz, J. (2019). Student-perceived teaching quality: How is it related to different achievement emotions in mathematics classrooms*? Learning and Instruction, 61,* 45-59. https://doi.org/10.1016/j.learninstruc.2019.01.001

Li, L., Peng, Z., Lu, L., Liao, H., & Li, H. (2020). Peer relationships, self-efficacy, academic motivation, and performance in mathematics in Zhuang adolescents: A moderated mediation model. *Children and Youth Services Review, 118*, 105358. https://doi.org/10.1016/j.childyouth.2020.105358

Lin, L. C. (2012). *Measuring adult learners' foreign language anxiety, motivational factors, and achievement expectations: A comparative study between Chinese as a second-language students and English as a second language students* [Unpublished doctoral dissertation]. Cleveland State University. https://engagedscholarship.csuohio.edu/etdarchive

Marinko, I., Bauziene, Z., Daniels, N., Golebiowski, A., Hughes, J., Kairiene, V., & Rees, A. (2015). *Empowering teachers for a student-centered approach*. http://www.wsh.pl/wp-content/uploads/2015/05

McKinstery, J., & Topping, K. J. (2003). Cross-age peer tutoring of thinking skills in the high school*. Educational Psychology and Practice, 19*(3), 199-217. https://doi.org/10.1080/0266736032000109465

McMaster, K. L., Fuchs, D., & Fuchs, L. S. (2006). Research on peer-assisted learning strategies: The promise and limitations of peer-mediated instruction. *Reading & Writing Quarterly, 22*(5), 5-25. https://doi.org/10.1080/10573560500203491

McMillan, J. H., & Schumacher, S. (2006). *Research in education: Evidence-based inquiry*. Pearson Education.

Metzler, J., & Woessmann, L. (2010). The impact of teacher subject knowledge on student achievement: Evidence from within teacher within-student variation. *IZA Discussion Paper, 4999.* https://doi.org/10.2139/ssrn.1634795

Monk, D. H. (2007). Recruiting and retaining high-quality teachers in rural areas. *The Future of Children, 17*(1), 155-174. https://doi.org/10.1353/foc.2007.0009

Roberts, A. K. (2019). *Grade 12 peer tutors' conceptions of their role as motivators for grades 8 and 9 mathematics learners* [Unpublished master's thesis]. University of Johannesburg.

Seidel, T., & Shavelson, R. J. (2007). Teaching effectiveness research in the past decade: The role of theory and research design in disentangling meta-analysis results. *Review of Educational Research, 77*(4), 454-499. https://doi.org/10.3102/0034654307310317

Smith, J. K., Smith, L. F., Gilmore, A., & Jameson, M. (2012). Students' self-perception of reading ability, enjoyment of reading and reading achievement. *Learning and individual differences, 22*(2), 202-206. https://doi.org/10.1016/j.lindif.2011.04.010

Summers, J. J. (2006). Effects of collaborative learning in math on sixth graders' individual goal orientations from a socio constructivist perspective. *The Elementary School Journal, 106*(3), 273-290. https://doi.org/10.1086/501487

Topping, K., Duran, D., & Van Keer, H. (2015). *Using peer tutoring to improve reading skills: A practical guide for teachers*. Routledge. https://doi.org/10.4324/9781315731032

Trochim, W. M., & Donnelly, J. P. (2001). *Research methods knowledge base*. Atomic Dog Publishers.

WAEC. (2021). Press statement: Release of provisional results: West African senior school certificate examination (WASSCE) for school candidates 2021. *West African Examinations Council*. https://www.waecgh.org/article/167/-release-of-provisional-results-west-african-senior-school-certificate-examination-wassce-for-school-candidates-2021-/

Williams, T. (2021). Understanding the influence of teacher leadership and teacher quality on student performance. In R. D. Johnson (Ed.), *Handbook of research on multidisciplinary perspectives on managerial and leadership psychology* (pp. 354-384). IGI Global. https://doi.org/10.4018/978-1-7998-3811-1.ch017

Xia, Y., & Yang, Y. (2019). RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior Research Methods, 51*(1), 409-428. https://doi.org/10.3758/s13428- 018-1055-2

Yamane, T. (1973). *Statistics: An introductory analysis.* Harper and Row.

Young, L. E., & Paterson, B. L. (2007). *Teaching nursing: Developing a student-centered learning environment.* Lippincott Williams & Wilkins.

Zuzovsky, R., & Donitsa-Schmidt, S. (2017). Comparing the effectiveness of two models of initial teacher education programs in Israel: Concurrent vs. consecutive. *European Journal of Teacher Education, 40*(3), 413-431. https://doi.org/10.1080/02619768.2017.1318377

APPENDIX A: QUESTIONNAIRE

A survey knowledge base on the mediation and moderation effects of motivation and teaching quality on the relationship between peer tutoring and mathematics achievement.

Dear participant, this survey is purely for academic purposes only. Your response will be treated with extreme confidently**.**

Background Information

Please tick [√] where appropriate.

1. Gender: Male [ ] Female [ ]
2. Age: 11-15 [ ] 16-20 [ ] 20-25 [ ] Above 20 [ ]
3. Occupation: Student [ ] Teacher [ ] Trader [ ] Driver [ ]
4. What is the highest level of education completed by your parent? Basic level [ ] Secondary level [ ] Tertiary level [ ]
5. Which form are you? Form 1 [ ] Form 2 [ ] Form 3 [ ]

Rank the Following Factors That May Contribute to Your Acceptance or Rejection on Peer Tutoring

Key: **SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; & SA: Strongly agree**

Table A1.

SN	Peer tutoring	SD	D	N	A	SA
1	Peer tutoring is an effective intervention for improvement of content knowledge & increase understanding of subject matter.					
2	Peer tutoring is found to be effective in improving students' grades, developing students' engagement & improving students' behavior in the classroom.					
3	In peer tutoring students work in one-on-one pair which increases academic commitment in the classroom.					
4	Peer tutoring creates a friendly learning environment in the class.					
5	Peer tutoring provides the learners an opportunity to enhance their social and behavioral abilities, including communicating, sharing and cooperating with each other in the classroom.					
6	Peer tutoring helps teacher to engage all students of the class in learning activity according to their individual needs.					
7	Peer tutoring techniques are successful and effective for high school students with learning disabilities.					
8	Students learn through teaching and earn opportunity to correct their errors in peer tutoring.					
9	Peer tutoring helped weak students to make active participants of the class.					

Rank the Following Factors That May Contribute to Your Acceptance or Rejection on Mathematics Achievement

Table A2.

SN	Mathematics achievement	SD	D	N	A	SA
1	During a maths class, I feel most fulfilled when I attain a good score in a test.					
2	I feel most fulfilled when I feel confident about the content in a maths course.					
3	During peer tutoring in maths, I feel most fulfilled when I am able to solve a difficult problem.					
4	During a maths course, I feel most fulfilled when other students accept my ideas.					
5	I participate in maths class during peer tutoring to get a good grade.					
6	I participate in maths class during peer tutoring to perform better than other students as compared to normal class.					
7	Small group discussion improves my understanding of mathematics.					
8	I seek assistance from my classmates when unable to solve mathematics problem.					
9	Students achieve their academic goals and improve their social relations all together.					
10	Peer tutoring provide an opportunity to engage all students in practicing Mathematics problems.					

Rank the Following Factors That May Contribute to Your Acceptance or Rejection on Teaching Quality

Table A3.

SN	Teaching quality	SD	D	N	A	SA
1	My classmates put a lot of time into commenting on my work.					
2	Peer tutors are extremely good at explaining things.					
3	The peer tutors make a real effort to understand difficulties I may be having with my work.					
4	The peer teaching staff work hard to make their subjects interesting.					
5	Support to student learning (initiatives helping students to work efficiently).					
6	Support to teaching and learning environment (libraries, computing facilities, virtual learning environment ...).					
7	Support to organizations, management of programmes at peers' level.					
8	Peer tutor's awards for 'good' tutor's awards of remarkable quality teaching initiated by teachers.					
9	Funds to promote motivational teaching.					

Rank the Following Factors That May Contribute to Your Acceptance or Rejection on Motivation

Table A4.

SN	Motivation	SD	D	N	A	SA
1	Qualified teachers are better motivated than unqualified teachers.					
2	Female teachers are better motivated than male teachers.					
3	Financial incentives motivate me more than non-financial incentives.					
4	Feedback is aimed at motivating the learner intrinsically.					
5	I am motivated to go extra miles when taught by peers.					
6	I can explain the things that I learned in my own words in mathematics subject.					
7	I can build up a connection between my current learning and previous learning in mathematics when assisted by peers.					
8	I think that mathematics improves my intelligence.					
9	I am highly motivated in mathematics class when I see that my classmate is leading the class discussion.					