

Research Article

Enhancing Mathematics Education Quality: A PLS-SEM Analysis of Teaching Self-Efficacy, Instructional Behaviours, Learning Motivation, and Learning Approach

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Abstract: Improving the quality of mathematics instruction is compatible with the goals of the Cambodia Education Vision 2030. In contrast, there is a lack of research exploring the links between teachers' characteristics and students' psychology. This research examined the theoretical basis for the roles of self-efficacy, classroom instruction, motivation, and learning strategies in the quality of mathematics instruction. Using a correlational design, a sample of students attending eight secondary schools in Kampong Cham Province was selected for a questionnaire study. The final sample comprised 1,196 senior high school students aged 17-20 years, who were categorised as non-urban (32.0% male, 43.8% female) and urban (8.9% male, 15.2% female). Partial least squares structural equation modelling (PLS-SEM) was used, and the scale demonstrated satisfactory internal consistency (Cronbach's $\alpha = 0.820$). SEM analyses revealed that teaching self-efficacy significantly predicted effective instructional practices that enhanced students' motivation. Notably, students' approaches to learning, both deep and surface learning, partially mediated the relationships between instructional practices and academic achievement. In addition, there were significant differences between the urban and non-urban groups in perceived resources and learning motivation. Teacher self-efficacy plays an essential role in creating productive learning environments and stimulating students' active participation in the learning process. Therefore, the research results can help Cambodian policymakers address this critical issue and improve the quality of education in urban and remote areas, thereby helping the country produce high-quality STEM educators.

Keywords: mathematics education; teaching self-efficacy; instructional behaviours; learning motivation; learning approach; structural equation modelling

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1. Introduction

Enhancing the quality of mathematics education is necessary to equip individuals to analyse and solve problems in contemporary society (Geiger et al., 2023). Although curriculum changes and the availability of teaching materials have been implemented, several educational institutions still experience poor academic performance among their students in the subject, math anxiety, and deficits in higher-order thinking skills (Azid et al., 2022; Tanujaya et al., 2017). Studies have begun to identify certain teaching variables, such as teaching self-efficacy (TSE) and learning motivation (LM), as determinants of effective instruction (Alibakhshi et al., 2020; Schwab, 2019).

The construct of self-efficacy, or teachers' belief in their competence to organise and control the teaching and learning process, is theoretically and empirically well-grounded in relation to teaching behaviour (Guidetti et al., 2018; van Dinther et al., 2013). More competent teachers will have higher goals for themselves, persevere in the face of difficulties, and employ adaptive strategies that foster deep learning (Chew & Cerbin, 2020). Teaching behaviour consists of lesson planning, questioning, utilisation of formative assessment techniques, and classroom management, and reflects teachers' intentions and affects learners' chances to acquire new knowledge (Fabiano et al., 2018). Motivation is a psychological construct mediated by instructional behaviours (IB), influencing learners' involvement in learning and their achievement (Sadoughi & Hejazi, 2023). A structural equation modelling (SEM) approach is a robust methodological tool for studying such multilevel phenomena

simultaneously (Deng et al., 2018).

With the help of latent variables that are operationalised with several indicators, as well as the examination of both direct and indirect relations among constructs, SEM can help understand the mechanisms through which teachers' self-efficacy impacts their teaching activities and how it ultimately influences students' motivational attitudes and performance outcomes (Bandura, 1986). An application of SEM in math education allows for testing theoretical constructs and controlling for measurement error in a single study (Sideridis et al., 2018). This study applies SEM to examine the interactions among TSE, instructional practices, and LM and their impact on mathematics education.

This study draws on prior literature and current theories to pinpoint leverage points for teacher training and instructional improvement (Bernacki, 2025). Using theory, measures, and advanced multivariate analysis, this research offers practical implications for policymakers, teacher trainers, and administrators seeking scientifically informed approaches to improve mathematics teaching (Darling-Hammond et al., 2023). These findings are meant to guide interventions that can boost teachers' self-confidence, improve teaching methods, and inspire students, all of which will help enhance the standard of mathematics teaching.

This study aims to assess the levels of mathematics teachers' TSE and IB, as well as students' LM and approaches to learning mathematics. It further seeks to examine the relationship between teachers' TSE and their IB and to determine the effects of TSE and IB on students' LM. In addition, the study investigates the relationship between students' LM and their approaches to learning mathematics and examines the mediating role of LM in the relationship between teachers' TSE and students' learning approaches (LA). It also explores whether IB mediates the relationship between TSE and LM. Furthermore, the study tests an integrated structural model that explains how TSE, IB, and LM predict students' AP, and evaluates the direct and indirect effects among these variables using SEM. Finally, the study seeks to identify the key factors associated with enhancing the quality of mathematics education.

The study addresses the following research questions: What are the levels of mathematics teachers' TSE and IB, as well as students' LM and approaches to learning mathematics? What significant relationships exist among TSE, IB, LM, and approaches to learning mathematics? To what extent does TSE influence its IB? To what extent do TSE and IB influence LM? To what extent does LM influence their approaches to learning mathematics? Do IB and LM mediate the relationship between TSE and students' approaches to learning mathematics? Finally, does the proposed SEM adequately explain the factors associated with the quality of mathematics education?

2. Literature Review

Mathematics education is not only contingent on the chosen curriculum and materials but also on the teaching approaches and beliefs of instructors and the learning and motivational tendencies of students (Li et al., 2025; Osei-Wusu et al., 2026). Mathematics is often powerfully perceived by students as complex, abstract, and reliant on prior knowledge (Alreshidi, 2023; Sidney & Alibali, 2014). Therefore, a teacher's role in providing high-quality education is to be fearless in their explanations, accurately identify challenges and errors, apply the most effective strategies, and motivate students to study the subject at school.

The quality of mathematics education can be defined as the ability of the teaching process to ensure that students gain an in-depth understanding of its concepts, acquire procedural fluency, develop mathematical skills and reasoning abilities, build self-confidence, and develop the capability to use mathematics in relevant settings. In this regard, a high-quality math education is not limited to the mastery of rules and procedures (Phan et al., 2026). It also encompasses the development of a student's ability to explain the underlying principles, use a variety of representations of mathematical ideas, and apply mathematical thinking in real-life scenarios to solve complex problems (Baki et al., 2009). Instructional quality is often attributed to several dimensions (Phan et al., 2025). These include classroom organisation, student activation, instructional clarity, formative assessment, teacher support, meaningful questions, feedback, and opportunities for student engagement.

In the case of mathematics classrooms, the instructional quality is also determined by the extent to which teachers promote mathematical discussion, encourage multiple methods,

relate concepts to real-world contexts, and use mistakes as teaching tools (Phan & Harth, 2025; Phan et al., 2025). The notion of education quality is multidimensional, and student achievement is only one of the outcomes (Appels et al., 2024). Although learning results are important, they do not reflect the entire quality of the educational process. In addition to academic outcomes, students' motivation, engagement, confidence, independence, and approaches to learning are valuable indicators (Liu et al., 2024). A mathematics classroom may produce short-term results through memorisation but fail to promote a sustainable understanding of the concepts or positive attitudes towards the discipline (Brisson et al., 2017). For this reason, the current study accounts for education quality through the combination of teacher-related and student-related factors.

TSE reflects teachers' beliefs in their capacity to organise and execute actions that lead to the desired instructional outcomes (Holzberger et al., 2013). The concept of self-efficacy is grounded in Bandura's social cognitive theory, which holds that individuals' thinking about their capabilities influences their motives, efforts, behaviours, emotional reactions, and accomplishments (Bandura, 1999). TSE beliefs generally involve perceptions about the effectiveness of their instructional strategies, classroom behaviours, and ability to engage learners (Poulou et al., 2019). Mathematics teachers with strong self-efficacy beliefs are more likely to accept challenges, overcome obstacles, and use a variety of instructional strategies to stimulate learning and improve students' achievements (Saadati et al., 2021).

Such teachers may also be more open to innovative approaches, including representation, modelling, and technology-aided processes, and provide the needed help to struggling learners (Orakci et al., 2023). Teachers with a low sense of self-efficacy might avoid instructional challenges, over-rely on expository pedagogy, discourage student discussion, and blame students' learning problems on factors outside their control (Zakariya, 2022). In addition, teachers with low self-efficacy might give up when their instructional strategies produce insufficient results (Yang et al., 2024). Nevertheless, self-efficacy should not be mistaken for general pedagogical or domain knowledge.

Even the most confident instructors benefit from enhancing their pedagogical content knowledge and acquiring new teaching approaches and assessments. Studies on teacher efficacy indicate that individuals' beliefs in their teaching powers are shaped by their learning experiences, observations of others' successes, social influences, and physiological reactions (Phan et al., 2026). Thus, positive experiences and successes during instruction can reinforce teachers' sense of self-efficacy, whereas their failures, impeding circumstances, and discouraging interactions with students, parents, and administrators undermine it.

Moreover, effective school organisation and leadership, peer support, and professional development practices play a role in building efficacy (Gabriele & Joram, 2007). In the context of math pedagogy, teaching efficacy is extremely important since math teachers need to overcome students' limitations and prejudices while nurturing their mathematical minds. Teachers who believe in their ability to influence student learning can overcome diverse challenges in the classroom and develop more effective pedagogy (Aikenhead, 2017).

IB concerns observable actions that teachers perform to facilitate learning (Cents-Boonstra et al., 2020). These include explaining, asking questions, organising, giving feedback, checking for understanding, managing class interactions, differentiating instruction, and engaging students in their learning. Effective mathematics IB involves direct explanation and the promotion of independent thinking and problem-solving (Suprayogi et al., 2017). While direct instruction is often necessary to introduce new concepts or procedures, effective instruction involves more than telling students what to do.

Teaching strategies such as asking questions, engaging students in discussions, using guided practice, problem solving, and checking for understanding ensure that students gain conceptual understanding as well as procedural skill (Phan et al., 2025). Effective mathematics instruction enables students to understand not only how to get an answer, but also why and when to use a particular method (Phan & Heng, 2026). IB also encompasses affective and relational aspects (Goodboy & Myers, 2008). The teacher communicates his or her expectations via responses to questions, mistakes, and levels of achievement demonstrated by students.

Encouragement, patience, respect, and emotional support may affect students' motivation to engage in challenging mathematical tasks (Bora, 2025). The teachers' efficacy

beliefs relate to their IB in a theoretically interesting manner. Presumably, teachers who feel most capable of teaching math may display the highest degree of instructional flexibility and persistence. Such educators may be more likely to utilise alternative explanations, representations, task differentiation, and additional support. Meanwhile, teachers with low efficacy may exhibit a narrow range of instructional methods and be less inclined to innovate or continue intensive practices (Dingfelder & Mandell, 2011).

Notwithstanding this, the association between the two variables is not necessarily linear. Teachers' efficacy beliefs influence their IB, but these behaviours are also determined by factors such as class sizes, time limits, curricular demands, assessment policies, administrative guidelines, available resources, and professional development opportunities (Van Doorn & Van Doorn, 2014). This implies that self-efficacy beliefs may moderate the influence of the aforementioned variables on the teachers' behaviours.

LM is defined by the processes that underlie students' initiation, direction, and continuation of their efforts in learning activities (Phan, 2025). Thus, in the context of mathematics, it is crucial to understand what affects students' initiation and continuation of learning, the amount of their effort, persistence in overcoming challenges, seeking and using assistance, and learning regulation. Self-determination theory (Deci & Ryan, 2000) addresses LM from the perspective of three types of motivation: intrinsic, extrinsic, and amotivation. According to the theory, different types of motivation shape students' learning efforts depending on whether the activity is initiated by an innate desire for competence and challenge (intrinsic motivation), an expectation of an external reward or avoidance of punishment (extrinsic motivation), or no motivation at all (amotivation) (Ryan & Deci, 2000).

Moreover, self-determination theory highlights the role of autonomy, perceived competence, and relatedness to the subject of study (Ryan & Deci, 2006). In particular, students need choice, an opportunity to succeed, and acceptance and support from their teachers and peers to develop a positive attitude toward learning (Richter & Tjosvold, 1980). The teacher's role in fostering these needs in students is to plan lessons that allow students to make decisions, experience competence through appropriate challenges, receive feedback, and build positive relationships with peers during group work.

Expectancy-value theory aims at understanding student motivation in terms of valuing the activity and expecting to succeed at it (Wigfield & Tonks, 2002). According to expectancy-value theory, students are more likely to invest effort in activities they find valuable (Eccles & Wigfield, 2023). The value may be different for each student, depending on the task's interest, utility, and importance. At the same time, students' persistence and effort are linked to their expectations of success (Palacios-Abad, 2021). If students do not think that they can succeed at completing the task, they might avoid it or put little effort into it. The teacher's role in influencing students' motivation to learn mathematics is to shape their expectations and perceptions of the value of learning (Phan et al., 2025). For instance, teachers can shape students' expectations of success by providing appropriate support and challenging tasks that build their skills and competence. Similarly, the teacher's role might be to foster students' perceptions of the learning value, for instance, by demonstrating the real-world applications of the material studied or by using engaging instructional tasks and discussions to highlight the interesting and challenging aspects of mathematics.

Finally, teachers can help students formulate learning goals, provide feedback, and see mistakes as opportunities to learn, helping avoid demotivation from incorrectly learned material (Phan & Harth, 2025). Motivation is therefore not solely an individual characteristic of students (Phan & Heng, 2026). It also originates from classroom experiences. Instructional climate generated by the teacher may either enhance or diminish students' willingness to learn mathematics.

LA defines how students perform academic tasks, process information, regulate their learning behaviours, and perceive the purpose of learning (Phan et al., 2026). Many later researchers classify LAs in general, and in particular for mathematics, into deep, surface, and achieving strategies (Biggs, 1989). A DLA encompasses an intention to understand concepts, relationships, and interconnections, and to apply knowledge in novel situations.

In math, this strategy includes activities such as grasping underlying principles, explaining processes and procedures, comparing and contrasting, and applying math in different contexts (Phan & Harth, 2025). A surface approach incorporates factual

reproduction and rote learning and is characterised by a superficial understanding of the material (Koedinger et al., 2012). In math, it can mean memorising formulas, procedures, and notation without understanding the underlying principles and conditions under which they apply. Although factual reproduction is sometimes useful for math, its effectiveness is limited.

An achievement-oriented or strategic approach focuses on earning high grades through appropriate learning strategies, ensuring that the information is learned well enough to be used in the future (Cuthbert, 2005). In math, it could include strategic planning, time management, and assessment of requirements (Sullivan et al., 2012). While it ensures high grades and effective learning, it might lead to a distorted view that good grades are more important than actual learning.

Students do not always adopt just one approach to their learning. In different contexts, their approaches can vary depending on the nature of the task, assessment practices, teacher expectations, previous learning, and levels of confidence and motivation (Llort et al., 2018). For example, a test based around recall is likely to promote surface learning, whereas mathematical investigations or explanations of solutions may encourage learners towards a deeper approach. LM is likely to affect students' approaches to learning. Students who are intrinsically motivated and feel confident about their abilities are more likely to adopt a deep approach (Phan, 2025). Students who feel anxious or pessimistic about their results, or who have expectations of achieving specific grades, may be more likely to adopt surface or strategic LAs (Heikkilä et al., 2010). However, a student's motivation and their LA can be interrelated. Positively reinforced learning can make students more confident and, therefore, more motivated.

3. Materials and Methods

To explore the variables that improve the quality of mathematics education, this study employs a predictive and correlational design (Stanton, 2017). The data will be collected using valid and reliable Likert-type questionnaires administered to a selected group of mathematics students to assess their perceptions of teachers' behaviours. The research design targets the mediation model, specifically whether the cause variable, "teaching self-efficacy," is sufficiently effective in explaining the indirect effect on the mediator variable of teachers' "instructional behaviours," the mediator influencing students' variable "learning motivation," and the positive effect on the learning outcome "learning approach". The conceptual framework for examining the relationship between TSE, IB, LM, and LA aims to improve the quality of mathematics education (figure 1). This theory contends that the combination of these elements significantly influences students' learning outcomes, raising the bar for education overall.

The research will take place in a Grade 12 high school located in Kampong Cham Province, Cambodia, where there are 8 high schools with math students. This location offers a distinctive environment ideal for conducting a PLS-SEM analysis of the quality of mathematics education, making it well-suited to analysing relationships between teacher and student variables. The population for this research comprises grade 12 students in Kampong Cham Province, Cambodia, in 2024, across 8 schools. A total of 1,196 students were selected to answer the questionnaires based on students' perceptions.

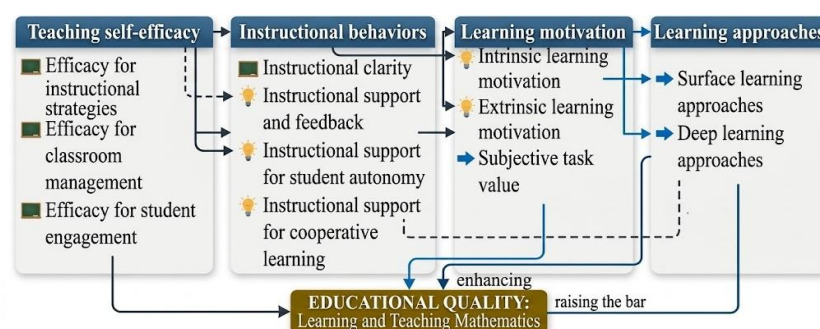


Figure 1. Conceptual framework for the relationship between TSE, IB, LM, LA, and effective learning outcomes.

In the correlational design, the sample size was determined based on the

recommendation by Hair et al. (2019). When confirmatory factor analysis (CFA) and SEM are involved, the sample size is normally at least five times as large as the number of observed variables to be analysed, but to be more acceptable, it is at least ten times as large as the number of observed variables or items (Hair et al., 2025; Hair et al., 2019). The participants for this design were randomly selected to respond to the survey questionnaire. More than 95% of the responses were complete. The final sample for analysis consisted of (N=1,196) math students, with grade 12 students in Kampong Cham Province, Cambodia. Frequencies of gender and location: 42.0% males=502 and 58.0% females=694, mean=3.87, SD=0.298. Mathematics students majoring in mathematics accounted for more than half of the noted sample (42.0 and 58.0%).

Table 1 presents descriptive statistics for the location and age variables, disaggregated by sex. In terms of the location variable, males (N=502) had an average of 1.36 (SD=0.48), whereas females (N=694) had an even slightly higher mean at 1.39 (SD=0.48). In both cases, there was negative kurtosis at -1.65 and -1.81, respectively, indicating a relatively flat distribution compared to what would be considered normal. In terms of age, males had an average of 17.32 years (SD=0.88), whereas females had an average of 17.02 years (SD=0.78). The male group had a skewness of 0.89 and a kurtosis of 2.56, indicating a peaked and right-skewed distribution. The Shapiro-Wilk tests were conducted for all variables, and the results show (all $p < .05$) that, for both males and females, there is a significant deviation from normality for both the location and age variables.

The instrument measuring each subconstruct of TSE (i.e., teachers' efficacy for instructional strategy, efficacy for classroom management, efficacy student engagement), of IB (i.e., teacher's instructional charity, instructional support and feedback, instructional support for student autonomy, instructional support for cooperative learning), of LM (i.e., students' intrinsic learning motivation (ILM), extrinsic learning motivation (ELM), subjective task value) was developed using the technique of translation and back-translation and of LA (i.e., surface learning approach (SLA) and deep learning approach (DLA)) used measurement tools have been developed by researchers.

Table 1. Descriptive statistics.

	Gender	N	Mean	SD	Skewness		Kurtosis		Shapiro-Wilk	
					Skewness	SE	Kurtosis	SE	W	p
Location	Male	502	1.36	0.48	0.59	0.10	-1.65	0.218	0.60	3.4
	Female	694	1.39	0.48	0.43	0.09	-1.81	0.185	0.62	1.96
Age	Male	502	17.32	0.88	0.89	0.10	2.56	0.218	0.84	8.0
	Female	694	17.02	0.78	0.29	0.09	0.40	0.185	0.85	8.7

Note: N=1,196.

Commonly used tools include the study process questionnaire (Biggs, 1978) and the learning process questionnaire (Biggs, 1993). First, the original English scales were adapted by the researchers and then translated into Khmer by two bilingual Cambodian researchers. Using the translated version, we translated the scales back into English. After that, we compared the Khmer and English versions of the scales to determine whether each item retained its original meaning. Second, the Khmer version of the scales was administered to 36 grade 12 students, who completed 63 items to evaluate the reliability of each item in the pilot test. We then met face-to-face with all 36 students to obtain feedback after completing the questionnaires. Second, the Khmer version of the scales was applied to (N=1,196) grade 12 students' answers with 63 items in different high schools in Kampong Cham province (private, public school, urban, and non-urban). Non-urban (32.0% male and 43.8% female) and urban (male = 8.9% and female = 15.2%, mean = 3.87, age = 17-20, SD = 0.294, Cronbach's $\alpha = 0.820$) from Kampong Cham Province, Cambodia.

In this study, we used a self-report method to assess subjective perceptions of the items on each adapted scale, which may introduce response bias. In all the scales, students had to rate each item on a 5-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Third, data entry into the database in Excel or SPSS was cleaned (checking for missing data, outliers, and normal distribution). To ensure the subconstructs fit the Cambodian teachers' and students' educational context and to assess the model's construct validity, CFA

was conducted. Before the CFA, we assessed normality and multicollinearity. The normality of the data was assessed using the skewness and kurtosis of each item.

The relationship between TSE, IB, LM, LA, and learning quality will be analysed using PLS-SEM. The process will involve 2 stages and four steps: (1) data before collection (the original scales in English were adapted and translated into Khmer); (2) testing the measurement with content validity and face validity (36 pilot-tested); (3) after data collection, validity (construct validity, convergent validity, divergent/discriminant validity) was assessed, and factor analysis was performed; and (4) checked the internal consistency reliability (Cronbach's alpha, construct/ composite reliability, and SEM).

The CR measure was used for the assessment of the measurement model's reliability for the four primary constructs (table 2). Based on the data presented in the table, the highest reliability was observed for the TSE construct at 0.847, well above the standard threshold of 0.70. Although the CR for the other three constructs, namely IB (0.724), LM (0.738), and LA (0.712), is slightly above the standard measure of 0.70, it is still within the range of 0.60 to 0.70, which is acceptable for exploratory research in social sciences.

Table 2. Composite reliability (CR) values for each construct in a table format for clarity.

Construct	Composite reliability
TSE	0.847
IB	0.724
LM	0.738
Las	0.712

The 0.70 rule says that in SEM, if the CR is greater than 0.70, it is considered the “gold standard” for good reliability. The 0.60 threshold shows that if the CR ranges from 0.60 to 0.70, it is considered “good enough” or “moderate.” This is particularly true if your study is investigating new scales and/or behaviours. Since three of your variables fall within this range, it is essential to note that they are still statistically viable. TSE is your most “reliable” construct, meaning the items measuring it are most consistent.

To validate the subconstructs in the teacher education context in Cambodia, CFA was conducted. Before the CFA, we assessed normality and multicollinearity. The normality of the data being analysed was assessed using the skewness and kurtosis of each item. Normally, the skewness and kurtosis values of a normal distribution range between -1 and +1 and between -1.96 and +1.96, respectively. In the present research, the skewness and kurtosis of all the items used ranged from -0.90 to +0.64 and from -1.03 to +1.72, respectively. Multicollinearity exists when the intercorrelation between items or variables exceeds 0.85. The intercorrelations among items in this study ranged from 0.08 to 0.76, indicating no multicollinearity.

During the CFA, we checked for construct validity and reliability for each subconstruct. To ensure construct validity, convergent and discriminant validities were assessed by calculating and comparing the average variance extracted (AVE), the maximum shared variance (MSV), and the average shared variance (ASV) for each subconstruct (Cheah et al., 2018). The AVE should be 0.50 or higher for adequate convergent validity, which means that a group of measured variables or items shares a high proportion of variance in the same construct, and the AVE should be greater than the MSV and ASV for acceptable discriminant validity, which means that one construct is distinct from other constructs (Hair et al., 2019). In the present study, the AVEs for the subconstructs were greater than 0.50, and the AVE for each subconstruct was also higher than its MSV and ASV. Furthermore, cross-loadings were not allowed to ensure one-dimensionality.

Finally, 63 items with factor loadings lower than 0.50 were removed for desirable internal consistency. The standardised factor loadings for the items used ranged from 0.56 to 0.91, exceeding the recommended threshold of 0.50, and the construct reliabilities for the subconstructs ranged between 0.83 and 0.91, exceeding the recommended threshold of 0.70. There were two CFAs in this study. The CFA results for the model for the relationship between TSE, IB, LM, and LA demonstrated that the measurement model fitted the empirical data very well, χ^2 (3047), $df=1763$, $p < 0.001$, CFI = 0.955, TLI = 0.952, SRMR = 0.0330, and RMSEA = 0.247.

The SEM results for the model for the relationship between TSE, IB, LM, and LA indicated that the measurement model also fitted the empirical data well, $\chi^2 (1164,601) = 2484.88$, $p < 0.001$, CFI = 0.93, TLI = 0.92, SRMR = 0.051, and RMSEA = 0.043. These results suggest that the four subconstructs of TSE, the three subconstructs of IB, the three subconstructs of LM, and the three subconstructs of LA could align with the teachers' and students' educational contexts in Cambodia.

4. Results

Measures of TSE were adapted from Skaalvik and Skaalvik (2016) and Tschannen-Moran et al. (1998). We tapped teachers' TSE through their perceived efficacy for instructional strategies (5 items, e.g., "My math teacher uses a satisfying teaching method", $\alpha = 0.691$), perceived efficacy for classroom management (5 items, e.g., "My math teacher can control my annoying behaviour with other students", $\alpha = 0.718$), and perceived efficacy for student engagement (5 items, e.g., "My math teacher helps me and other students understand the value of learning", $\alpha = 0.748$). The construct reliabilities for efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement were 0.691, 0.718, and 0.748 (see table 3).

Table 3. Item reliability statistics, M, SD, Cronbach's α of EIS, ECM, ESE.

	Mean	SD	If item dropped Cronbach's α
Efficacy for instructional strategies	3.81	0.498	0.691
Efficacy for classroom management	3.88	0.492	0.718
Efficacy for student engagement ^a	3.76	0.565	0.748
Age	17.14	0.839	0.233
Location	1.38	0.485	0.167
Gender ^a	1.42	0.494	0.217

Our measures of IB were adapted from multiple studies. We assessed IB through teachers' perceptions of teacher educators' instructional clarity (5 items, e.g., "My math teacher explained the purpose of the lesson clearly", $\alpha = 0.689$). Instructional support and feedback (5 items, e.g., "My math teacher advises me when I have a problem with lesson content or homework", $\alpha = 0.676$). Instructional support for student autonomy (5 items, e.g., "My math teacher accepts student suggestions when designing assignments", $\alpha = 0.679$) and instructional support for cooperative learning (5 items, e.g., "My math teacher discusses ideas with the other students in the group.", $\alpha = 0.742$). The construct reliabilities for instructional clarity, instructional support and feedback, instructional support for student autonomy, and instructional support for cooperative learning were 0.689, 0.676, 0.679, and 0.742 (see table 4).

Table 4. Item reliability statistics, M, SD, Cronbach's α of IC, ISSF, ISSA, ISCL.

	Mean	SD	If item dropped Cronbach's α
Instructional clarity	4.13	0.575	0.689
Instructional support and feedback	3.72	0.691	0.676
Instructional support for student autonomy	3.39	0.756	0.679
Instructional support for cooperative learning	3.66	0.511	0.742
Age	17.14	0.839	0.548
Location	1.38	0.485	0.380
Gender	1.58	0.494	0.533

Measures of LM were adapted from prior studies, particularly Dermitzaki et al. (2012). Mathematic students' LM was measured through its intrinsic (5 items, e.g. "In this education course, I prefer course content from which I can learn new things", $\alpha = 0.681$) (Pintrich et al., 1991), extrinsic components (5 items, e.g. "In this education course, if I can, I want to get better grades than most of my classmates", $\alpha = 0.692$) (Pintrich et al., 1991), and perceived subjective task value (STV) (5 items, e.g. "I will be able to use what I learn in this education

course in my future teaching career”, $\alpha = 0.714$). The construct reliability values for ILM, ELM, and STV were 0.681, 0.692, and 0.714 (see table 5).

Table 5. Item reliability statistics, M, SD, Cronbach’s α of ILM, ELM, and STV.

	Mean	SD	If item dropped Cronbach’s α
ILM	3.93	0.624	0.681
ELM	3.75	0.741	0.692
STV	4.28	0.501	0.714
Gender	1.58	0.494	0.427
Age	17.14	0.839	0.469
Location	1.38	0.485	0.255

Measures of LA were adapted from student learning, which can be either direct or indirect (Calderon, 2013; Weldy & Turnipseed, 2010). Mathematics students’ LA was measured through their perceived surface learning (5 items, e.g., “to understand math, students must try to do more research”; $\alpha = 0.703$. and perceived deep learning (5 items, e.g., “new knowledge and factual information make students enjoy learning”; $\alpha = 0.671$). The construct reliability values for SLA and DLA were 0.703 and 0.671 (see table 6).

Table 6. Item reliability statistics, M, SD, Cronbach’s α of SLA and DLA.

	Mean	SD	If item dropped Cronbach’s α
SLA	4.21	0.501	0.703
DLA	3.89	0.588	0.671
Gender	1.58	0.494	0.3243
Age	17.14	0.839	0.3879
Location	1.38	0.485	0.0387

The correlation matrix (table 7) represents the direction and strength of the relationship among your research variables. Pearson’s r stands for a number from -1 to +1. Positive values indicate one variable increases as the other increases; negative values indicate one variable increases as the other decreases. Significance is very strong (>99% probability that it is not a fluke). N (1,196) means that sample size throughout all tests. The most significant positive correlations indicate that the DLA had the strongest positive correlations with ILM ($r=0.442$) and EIS ($r=0.404$).

This means that as motivation to learn and the quality of instructional strategies increase, so does students’ performance within a deep learning framework. Correlations within instructional factors state that EIS (instructional strategies) had a .366 correlation with ISSA (student Assessment), meaning that when the instructional strategies were used, varied assessments were also used. Correlations that yielded .00 or negligible values indicate that ESE (engagement) had virtually no correlation with EIS, $r=.016$. This indicated that in this particular sample, there was no correlation between those factors.

“All variables demonstrated weak to moderate statistically significant positive associations ($p<.01$). It is evident that teacher instructional quality, student motivation, and student LA have the most inter-relations, with DLA being the best correlated with teacher instructional quality and student motivation.

The SLA ($=.25$) was greatly influenced by both ELM and ILM ($=.501$ and $=.349$, respectively), a point of surprise for many, as students’ ILM does predict using superficial methods of learning like rote memorisation, and this applies to mathematics too. The DLA ($=.23$) was also significantly predicted by STV ($=.357$) and ILM ($=.287$), suggesting that when a student found a subject intrinsically motivating and perceived that subject as having high personal value (as was the case with math learning here), that would lead to using deep learning strategies when tackling mathematics. This revealed some interesting inter-construct correlations.

Table 7. Correlation matrix of the relationships between TSE, IB, LM, and LAs. Pearson correlation coefficients were

computed.

		EIS	ECM	ESE	IC	ISF	ISSA	ISCL	ILM	ELM	STV
EIS	Pearson's r	—									
	N	—									
ECM	Pearson's r	0.140***	—								
	N	1196	—								
ESE	Pearson's r	0.016	-0.002	—							
	N	1196	1196	—							
IC	Pearson's r	0.315***	0.236***	-0.022	—						
	N	1196	1196	1196	—						
ISF	Pearson's r	0.342***	0.135***	0.006	0.362***	—					
	N	1196	1196	1196	1196	—					
ISSA	Pearson's r	0.366***	0.141***	-0.023	0.297***	0.462***	—				
	N	1196	1196	1196	1196	1196	—				
ISCL	Pearson's r	0.027	0.043	0.231***	0.111***	0.004	-0.022	—			
	N	1196	1196	1196	1196	1196	1196	—			
ILM	Pearson's r	0.326***	0.112***	0.039	0.239***	0.361***	0.343***	0.007	—		
	N	1196	1196	1196	1196	1196	1196	1196	—		
ELM	Pearson's r	0.258***	0.062*	-0.008	0.171***	0.270***	0.284***	0.008	0.392***	—	
	N	1196	1196	1196	1196	1196	1196	1196	1196	—	
STV	Pearson's r	0.048	0.072*	-0.008	0.155***	0.135***	0.098***	0.006	0.184***	0.179***	—
	N	1196	1196	1196	1196	1196	1196	1196	1196	1196	—
SLA	Pearson's r	0.152***	0.169***	-0.002	0.253***	0.223***	0.185***	0.039	0.176***	0.212***	0.240***
	N	1196	1196	1196	1196	1196	1196	1196	1196	1196	1196
DLA	Pearson's r	0.404***	0.131***	-0.055	0.272***	0.366***	0.366***	0.021	0.442***	0.390***	0.253***
	N	1196	1196	1196	1196	1196	1196	1196	1196	1196	1196

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

EIS = instructional strategies; ECM=classroom management; ESE student engagement; IC = instructional clarity; ISCL = cooperative learning; ISF = instructional support and feedback; ISSA = instructional support for student autonomy; ILM = intrinsic learning motivation; ELM = extrinsic learning motivation; STV = subjective task value; SLA = surface learning approach; DLA = deep learning approach.

Figure 2 presents the SEM model showing the relationships among TSE, IB, LM, and LAs. The model demonstrates multiple direct and indirect relationships between these constructs, with standardised coefficients indicating the strength and significance of the associations.

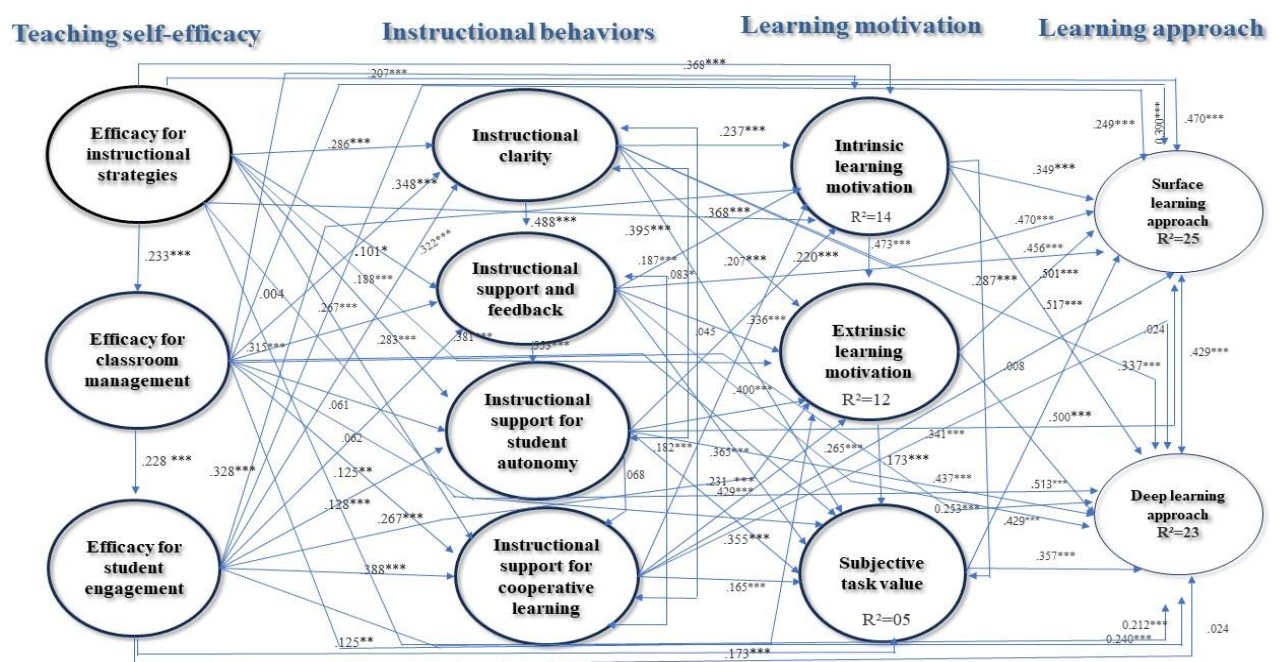


Figure 2. SEM scheme.

There was a moderate positive correlation between teaching efficacy for instructional

strategies and teaching efficacy for classroom management ($r = .233$), which means the different types of self-efficacy are interconnected (table 8). An interesting finding was that the “motivation gap,” that is, R^2 values between .05 and .14, was smaller than the R^2 values that predicted the student’s LA. This implies that student motivation shaped their approach to learning mathematics, but other external variables beyond the scope of this study might also influence their motivation.

Table 8. Indirect and total effects.

Type	Effect	Estimate	SE	95% C.I. (a)		B	Z	P
				Lower	Upper			
Indirect	ILM $\Rightarrow$ Efficacy for classroom management $\Rightarrow$ Efficacy for instructional strategies	0.001	0.001	-0.001	0.004	0.002	1.09	0.272
	ILM $\Rightarrow$ Efficacy for student engagement $\Rightarrow$ Efficacy for instructional strategies	0.002	0.001	-0.001	0.005	0.002	1.09	0.272
	ILM $\Rightarrow$ Instructional clarity $\Rightarrow$ Efficacy for instructional strategies	0.015	0.004	0.006	0.024	0.019	3.23	0.001
	ILM $\Rightarrow$ Instructional support and feedback $\Rightarrow$ Efficacy for instructional strategies	0.016	0.005	0.005	0.027	0.020	2.86	0.004
	ILM $\Rightarrow$ Instructional support for student autonomy $\Rightarrow$ Efficacy for instructional strategies	0.023	0.005	0.011	0.034	0.029	4.02	5.67
	ILM $\Rightarrow$ Instructional support for cooperative learning $\Rightarrow$ Efficacy for instructional strategies	2.65	8.58	-1.66	1.71	3.32	0.03	0.975
	ELM $\Rightarrow$ Efficacy for classroom management $\Rightarrow$ Efficacy for instructional strategies	-4.96	8.30	-0.002	0.001	-7.38	-0.59	0.550
	ELM $\Rightarrow$ Efficacy for student engagement $\Rightarrow$ Efficacy for instructional strategies	-1.39	7.01	-0.001	0.001	-2.06	-0.19	0.843
	ELM $\Rightarrow$ Instructional clarity $\Rightarrow$ Efficacy for instructional strategies	0.001	0.003	-0.004	0.007	0.002	0.58	0.557
	ELM $\Rightarrow$ Instructional support and feedback $\Rightarrow$ Efficacy for instructional strategies	0.004	0.002	1.94	0.009	0.007	2.04	0.041
	ELM $\Rightarrow$ Instructional support for student autonomy $\Rightarrow$ Efficacy for instructional strategies	0.011	0.003	0.004	0.018	0.016	3.04	0.002
	ELM $\Rightarrow$ Instructional support for cooperative learning $\Rightarrow$ Efficacy for instructional strategies	1.91	6.24	-1.20	1.24	2.84	0.030	0.975
	STV $\Rightarrow$ Efficacy for classroom management $\Rightarrow$ Efficacy for instructional strategies	4.55	0.001	-0.001	0.002	4.57	0.42	0.67
	STV $\Rightarrow$ Efficacy for student engagement $\Rightarrow$ Efficacy for instructional strategies	-5.22	9.54	-0.001	0.001	-5.25	-0.05	0.95
	STV $\Rightarrow$ Instructional clarity $\Rightarrow$ Efficacy for instructional strategies	0.007	0.004	-0.001	0.016	0.007	1.640	0.10
	STV $\Rightarrow$ Instructional support and feedback $\Rightarrow$ Efficacy for instructional strategies	1.59	0.002	-0.004	0.005	1.60	0.062	0.95
	STV $\Rightarrow$ Instructional support for student autonomy $\Rightarrow$ Efficacy for instructional strategies	-0.004	0.004	-0.013	0.003	-0.004	-1.15	0.25
	STV $\Rightarrow$ Instructional support for cooperative learning $\Rightarrow$ Efficacy for instructional strategies	4.41	1.40	-2.70	2.79	4.43	0.03	0.97
	SLA $\Rightarrow$ Efficacy for classroom management $\Rightarrow$ Efficacy for instructional strategies	0.004	0.003	-0.002	0.012	0.004	1.28	0.19
	SLA $\Rightarrow$ Efficacy for student engagement $\Rightarrow$	3.37	9.98	-0.001	0.002	3.39	0.33	0.73

Efficacy for instructional strategies								
Direct	SLA $\Rightarrow$ Instructional clarity $\Rightarrow$ Efficacy for instructional strategies	0.026	0.006	0.013	0.038	0.026	4.01	5.84
	SLA $\Rightarrow$ Instructional support and feedback $\Rightarrow$ Efficacy for instructional strategies	0.010	0.004	0.002	0.018	0.010	2.45	0.014
	SLA $\Rightarrow$ Instructional support for student autonomy $\Rightarrow$ Efficacy for instructional strategies	0.011	0.004	0.001	0.020	0.011	2.34	0.018
	SLA $\Rightarrow$ Instructional support for cooperative learning $\Rightarrow$ Efficacy for instructional strategies	-3.07	9.61	-0.001	0.001	-3.08	-0.03	0.974
	DLA $\Rightarrow$ Efficacy for classroom management $\Rightarrow$ Efficacy for instructional strategies	0.002	0.001	-0.001	0.005	0.002	1.12	0.260
	DLA $\Rightarrow$ Efficacy for student engagement $\Rightarrow$ Efficacy for instructional strategies	-0.002	0.002	-0.006	0.001	-0.002	-1.11	0.263
	DLA $\Rightarrow$ Instructional clarity $\Rightarrow$ Efficacy for instructional strategies	0.018	0.005	0.008	0.029	0.022	3.49	4.78
	DLA $\Rightarrow$ Instructional support and feedback $\Rightarrow$ Efficacy for instructional strategies	0.016	0.005	0.005	0.027	0.019	2.83	0.004
	DLA $\Rightarrow$ Instructional support for student autonomy $\Rightarrow$ Efficacy of instructional strategies	0.029	0.006	0.015	0.042	0.034	4.23	2.27
	DLA $\Rightarrow$ Instructional support for cooperative learning $\Rightarrow$ Efficacy of instructional strategies	-1.08	3.38	-6.73	6.51	-1.27	-0.03	0.974
Total	ILM $\Rightarrow$ Efficacy for instructional strategies	0.074	0.023	0.027	0.120	0.092	3.14	0.001
	ELM $\Rightarrow$ Efficacy for instructional strategies	0.034	0.018	-0.002	0.071	0.051	1.83	0.066
	STV $\Rightarrow$ Efficacy for instructional strategies	-0.087	0.025	-0.138	-0.036	-0.087	-3.36	7.58
	SLA $\Rightarrow$ Efficacy of instructional strategies	-0.011	0.026	-0.063	0.041	-0.011	-0.41	0.675
	DLA $\Rightarrow$ Efficacy for instructional strategies	0.199	0.025	0.148	0.249	0.234	7.73	1.04
	ILM $\Rightarrow$ Efficacy for instructional strategies	0.132	0.023	0.085	0.179	0.166	5.55	2.79
	ELM $\Rightarrow$ Efficacy for instructional strategies	0.052	0.019	0.013	0.090	0.077	2.65	0.007
	STV $\Rightarrow$ Efficacy for instructional strategies	-0.084	0.027	-0.137	-0.031	-0.084	-3.10	0.001
	SLA $\Rightarrow$ Efficacy of instructional strategies	0.041	0.027	-0.012	0.094	0.041	1.50	0.131
	DLA $\Rightarrow$ Efficacy for instructional strategies	0.263	0.026	0.212	0.314	0.310	10.11	0.190

Note: Confidence intervals computed with the method, including the standard (Delta method). Betas are completely standardised effect sizes.

The results demonstrate a complex pattern of relationships among teachers' TSE, IB, students' LM, and approaches to learning mathematics. The correlation analysis revealed predominantly positive associations among the study variables, with deep learning showing particularly strong relationships with ILM and with the efficacy of instructional strategies. The SEM results further indicated that students' LAs were predicted by different dimensions of LM. In particular, surface learning was associated with both ELM and ILM, whereas DLA was predicted by STV and ILM. The analysis of direct and indirect effects also showed that several instructional dimensions, particularly instructional clarity, instructional support and feedback, and support for student autonomy, contributed to statistically significant pathways within the proposed model, although not all indirect effects were statistically significant. Taken together, these findings provide empirical support for the interconnected roles of teacher- and student-related factors in mathematics learning and indicate that instructional practices and LM are important mechanisms linking TSE to students' approaches to learning.

5. Discussion

The results of this study add evidence that TSE, IB, students' LM, and approaches to learning are interconnected in math education. The SEM analysis revealed that teachers' beliefs about their ability to teach math influence their IB, while their teaching strategies partially determine students' LM and approaches. At the same time, the results stress that

educational quality could be improved by addressing both teacher- and student-related aspects, not only curricula and examinations (Algazo et al., 2025). Firstly, the positive relationship between TSE and IB confirms social cognitive theory (Ye & Hu, 2026). Indeed, Bandura (1986) stated that individuals' beliefs about their capabilities to perform certain activities influence their choices, interests, and motivation to act (Bandura et al., 2001; Bandura & Locke, 2003). Thus, the study found that teachers' general TSE predicted more effective PCK, general classroom management, learner engagement, and interpersonal relations. In other words, teachers' instructional beliefs and attitudes were positively related to their ability to explain material, use various representations, ask probing questions, give feedback, encourage, and differentiate.

Secondly, the link between teachers' self-efficacy and their classroom behaviours was also confirmed by Tschannen-Moran et al. (1998). These researchers stated that efficacy beliefs predict teachers' cognitive strategies and classroom actions. The results suggest that teacher efficacy should be conceptualised as a resource variable that may moderate the quality of classroom interactions. In other words, self-efficient educators are more likely to engage in IB associated with student learning (Young et al., 2003). For example, math teachers who possess a sense of power over the content are more likely to persist when students struggle and to try different instructional strategies. Such behaviours are likely common in math instruction, since students differ in their preparedness and often have learned various unrelated concepts before studying math.

However, efficacy beliefs alone may not be sufficient for teaching, since the educator needs a comprehensive knowledge of the subject, pedagogy, professional development, resources, and the school environment (Jones & Moreland, 2004). The link between IB and LM is further explained by self-determination theory (Deci & Ryan, 2000; Jones & Moreland, 2004). This theory highlights the importance of establishing a learning environment where students experience competence, mastery, autonomy, and relatedness. For instance, student motivation is increased when teachers provide encouragement, verbal and nonverbal feedback, collaborative activities, and appropriate intellectual challenge. Similar points are made by the expectancy-value theory, which emphasises the role of teachers' feedback in students' expectancy for success (Eccles & Wigfield, 2024).

The relationship between LM and LA further demonstrates that motivated students are more likely to engage with mathematics in more meaningful ways (Phan & Harth, 2025). Students who are interested in mathematics, believe they can succeed, and do not hesitate to persist may be more likely to make connections, explain their reasoning, monitor their progress, and apply their knowledge to unfamiliar problems. The finding supports Biggs' (1989) distinction between DLA and SLA. A DLA is one in which there is a desire to understand, whereas a SLA is tied to memorisation and minimal cognitive engagement.

The present results, therefore, show that motivation may enable students to move from memorising formulas and procedures to understanding mathematical principles and relationships. The mediation findings contribute significantly to the literature (Biggs, 1999). If IB mediated the relationship between TSE and students' motivation, this would imply that teachers' beliefs primarily influence learners through their classroom behaviours (Phan et al., 2025). A confident teacher does not influence students merely by feeling capable; the effect is educationally meaningful if confidence translates into supportive and cognitively demanding instruction (Biggs, 1998). If LM mediated the relationship between IB and LAs, the findings would further imply that effective teaching influences deeper learning, in part, by enhancing students' interest, perceived competence, and persistence (Biggs, 1998; Phan & Harth, 2025).

Overall, the results suggest that TSE is associated with IB, LM, and the students' approach to studying mathematics, mediated by an intervening variable (Phan et al., 2025). The present data also partially support the theoretical and empirical background discussed in the literature because IB has a significant impact on motivation. Nevertheless, the application of the SEM strategy allowed us to provide more accurate results than the analysis of the three variables separately. However, if the research design were cross-sectional rather than longitudinal, the statistical association between the observed variables cannot be inferred to be causal. Also, self-report measures could be biased by social desirability or by participants' misunderstanding of the items. Therefore, future studies should apply a design that would

consider the timing of events and analyse individual behaviour in classrooms using observations, achievement tests, and mixed designs. In conclusion, improving the quality of math education cannot be achieved merely by upgrading teachers' knowledge and skills or by increasing the time spent on the subject. Instructional methods should be aligned toward efficacy-building, supported by feedback, and differentiated to help students develop a growth mindset and a strong approach to learning the discipline.

These findings suggest that improving mathematics education requires an integrated approach in which teacher efficacy, instructional practice, and student motivation are addressed simultaneously. Strengthening teachers' confidence without translating it into effective classroom practices may have a limited impact, just as instructional improvement may be insufficient if students remain poorly motivated to engage deeply with mathematical content. The findings, therefore, highlight the importance of creating learning environments in which effective teaching practices foster motivation and, ultimately, encourage more meaningful approaches to learning mathematics.

6. Conclusions

This study concluded that improving the quality of mathematics education requires an in-depth understanding of teachers' beliefs, IB, and students' motivational and learning processes. The SEM analysis indicated that TSE beliefs, IB, LM, and LAs are interconnected concepts. Therefore, they should be regarded as an interrelated system rather than separate components of the quality of mathematics education. The role of TSE in mathematics education may be considered as a basis for achieving high-quality IB. In particular, teachers' positive expectations of their ability to teach mathematics contribute to their positive IB. For instance, efficacious teachers are more likely to provide effective explanations, use alternative examples to clarify important points, and apply various pedagogical tactics to stimulate student engagement and cognitive activation. Thus, the quality of IB may improve when teachers have positive self-efficacy beliefs and do not give up when their students face difficulties. The SEM analysis revealed that LM plays a critical role in the quality of mathematics education. IB mediates the relationship between teachers' self-efficacy and students' LAs. However, teachers need to have specific beliefs about their capability to deliver effective instruction. They need to be confident in their ability to foster students' conceptual understanding of mathematics. Therefore, efficacious teachers are more likely to provide high-quality instruction that, in turn, fosters students' LM. Researchers found that LM has a significant impact on students' LAs in mathematics education. IB plays a major role in fostering students' LM. If teachers have positive beliefs about their capacity to teach mathematics, they are more likely to develop effective IB. For example, they may provide clear explanations, give feedback to students, use various differentiation techniques, and stimulate student participation in learning. Moreover, they can structure the content in a way that helps students use their prior knowledge to build a sound conceptual understanding of mathematics. LM is also crucial for fostering students' positive attitudes towards mathematics. If students are interested in mathematics and believe that they can be successful in this challenging discipline, they are more likely to seek clarification of their doubts. They will also be more likely to take on challenging tasks and monitor their learning processes. However, if students are not interested in mathematics and believe that they are incapable of succeeding in this discipline, they will try to avoid any challenging tasks or use low-yield learning strategies, such as rote memorization. Students' motivation to learn mathematics may be influenced by their beliefs about the teacher, who is capable of clarifying unclear points and explaining essential concepts. The SEM analysis also indicated that LM has a significant impact on students' LAs to mastering the fundamentals of mathematics. As mentioned earlier, LM helps students develop positive attitudes towards mathematics. Since learning strategies are closely related to students' attitudes towards mathematics, motivated students are more likely to use effective learning strategies. They will be better at elaborating on and reflecting on the new information and applying the concepts they learned to solve new mathematical problems. At the same time, uninterested students are more likely to use ineffective learning strategies, such as rereading the textbook or memorising the algorithms without trying to elaborate on the materials they need to learn. Therefore, mathematics education should focus on fostering students' self-regulation and helping them develop effective learning strategies.

Learning strategies allow students to go beyond rote memorisation and become lifelong learners. The SEM analysis revealed that teachers' self-efficacy beliefs influence student LM, which, in turn, significantly predicts their LAs to mastering the fundamentals of mathematics. Therefore, improving teachers' efficacy beliefs about their ability to teach mathematics should lead to better learning outcomes. This study has several implications for teacher education and professional development. Teacher education programs should strive to enhance teachers' mathematical knowledge and equip them with strategies to strengthen their self-efficacy beliefs. Moreover, school administrations need to create a positive school culture and environment and provide teachers with the necessary resources to be successful educators. Teachers need to be encouraged to collaborate with one another to find effective ways to improve their instruction and foster students' motivation to learn. They need to be trained to design appropriate instructional sequences, conduct formative assessments, facilitate student-centred learning, enhance mathematical speaking and listening, and address the learning needs of all their students.

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