

## Exploring self-regulation as a mediator between teaching method and students' performance in Cambodian universities

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**Abstract:** This study investigates the mediating role of self-regulation in the relationship between teaching methods and students' academic performance in Cambodian higher education. The research aims to determine whether instructional strategies directly influence student outcomes and indirectly enhance performance by fostering self-regulation. A quantitative approach using SmartPLS (PLS-SEM) was applied to survey data from 320 academic staff across public and private universities. Measurement model results confirmed strong reliability and validity, while structural model analysis yielded  $R^2$  values of 0.242 for self-regulation and 0.135 for students' performance, indicating weak but acceptable explanatory power. Findings: Teaching methods had a significant positive effect on students' performance ( $\beta = 0.183$ ,  $t = 2.907$ ,  $p = 0.004$ ) and self-regulation ( $\beta = 0.491$ ,  $t = 12.432$ ,  $p = 0.000$ ). Self-regulation positively influenced performance ( $\beta = 0.242$ ,  $t = 3.867$ ,  $p = 0.000$ ) and partially mediated the relationship between teaching methods and performance ( $\beta = 0.119$ ,  $t = 3.633$ ,  $p = 0.000$ ). The study highlights self-regulation as a critical mechanism linking teaching strategies to academic success. The findings suggest that higher education institutions should adopt learner-centered pedagogies and embed self-regulatory skill development into curricula to enhance student engagement and performance.

**Keywords:** Higher Education, Mediating effect, Self-regulation, Students' performance, Teaching method.

### 1. Introduction

In the evolving landscape of Cambodian higher education, teaching method have emerged as a pivotal component of the learning environment that significantly influences student performance. As the country continues to recover from the effects of the COVID-19 pandemic, higher education institutions (HEIs) are under increasing pressure to adopt innovative teaching strategies that align with global educational trends and meet local challenges. While infrastructure development and access to education have received considerable attention, it is the quality and adaptability of teaching method that ultimately determine the effectiveness of higher education in Cambodia. In the post-pandemic era, where digital transformation and pedagogical innovation are essential, the examination of teaching practices within Cambodian HEIs becomes not only timely but crucial. Prior to the pandemic, conventional in-person teaching was the main approach used for instruction in Cambodia. Most institutions relied on lecture-based delivery, with limited use of technology or interactive methods. This approach, though consistent with the educational practices of many developing countries, often failed to engage students in active learning or promote higher order thinking skills. According to Sothan [1] the rigid teaching structure and lack of learner-centered strategies contributed to low academic performance and reduced motivation among Cambodian university students. As globalization began to influence the academic ecosystem, however, there was a gradual shift toward incorporating more flexible and student-centered teaching practices, although progress remained uneven across institutions [2].

The COVID-19 pandemic served as a major turning point, compelling a dramatic shift from traditional in-class teaching to online and blended learning models. This sudden transition was met with considerable challenges, including inadequate digital infrastructure, limited internet access, and low digital literacy among both students and faculty. However, the crisis provided a chance to reevaluate and develop new approaches to teaching. HEIs across Cambodia implemented various strategies to sustain instruction, such as video conferencing, recorded lectures, and the use of learning management systems [3]. Institutions like the Royal University of Phnom Penh and the Institute of Technology of Cambodia led efforts in deploying virtual classrooms, demonstrating the potential of online learning platforms in maintaining academic continuity during disruptions [4]. The shift also exposed the pedagogical limitations of many faculty members, who were unprepared for online delivery. Most educators lacked formal training in online instruction, which impacted their ability to effectively engage students in the virtual space. Amoah and Le Roux [5] observed that many instructors initially relied on passive delivery techniques, such as uploading PDFs or presenting PowerPoint slides without interactive components. As a result, students found it difficult to remain engaged, especially without the structure and accountability provided by physical classrooms. Over time, however, certain institutions started conducting professional development workshops to improve educators' digital and teaching competencies, leading to the use of more engaging instructional strategies like quizzes, discussion boards, breakout rooms, and group collaboration.

Importantly, these changes have brought attention to the role of blended learning—a combination of in-class and online instruction—as a sustainable and effective teaching method in the Cambodian context. Blended learning integrates traditional in-person teaching with digital tools, allowing educators to provide more adaptable, interactive, and engaging educational experiences. Prifti [6] highlighted the benefits of this model, including improved student engagement, enhanced accessibility to resources, and the promotion of personalized learning. For Cambodian students, particularly those from rural backgrounds who may struggle with full-time online access, blended learning offers a balanced alternative that combines face-to-face support with the flexibility of digital content. Teaching method in Cambodia are now expected to address a broader range of student needs, including those related to self-directed learning and self-regulation. Effective teaching today must go beyond content delivery to actively foster skills such as goal setting, time management, and reflective learning. In this regard, educators play a vital role in designing learning activities that promote student autonomy. As noted by Psathas, et al. [7] students who are encouraged to take responsibility for their learning tend to perform better academically. Therefore, teaching method that incorporate scaffolding techniques—gradually transferring responsibility from instructor to learner—are particularly valuable in Cambodia's higher education environment. One of the critical challenges in implementing modern teaching method is the disparity in institutional capacity. While urban universities are more likely to have access to resources and skilled faculty, rural HEIs often lack the infrastructure and funding necessary to implement innovative pedagogies. The digital divide continues to be a barrier, affecting the consistency of teaching practices across the country. To mitigate these challenges, the Ministry of Education, Youth, and Sport (MoEYS) of Cambodia has introduced policy guidelines and allocated resources to support capacity building and teacher training [3]. Collaborative partnerships with international organizations have also helped Cambodian institutions gain access to best practices and digital teaching tools. Despite the progress, there is a need for continuous evaluation and refinement of teaching method to ensure they meet the evolving demands of learners. Educators must consider the diversity of students' learning styles, backgrounds, and access to technology when designing instructional strategies [8]. Teaching must become more inclusive, engaging, and aligned with labor market needs. Furthermore, research focusing on the effectiveness of various teaching method in Cambodia is still limited, which hinders evidence-based policymaking. As emphasized by Sim and Em [9] the future of higher education in Cambodia depends significantly on the country's ability to institutionalize innovative, inclusive, and adaptive teaching practices that support both academic performance and long-term skill development.

This study seeks to understand how teaching method affects students' performance in the context of Cambodian higher education. Specifically, it examines the direct impact of instructional strategies on students' academic performance, as well as their influence on learners' ability to self-regulate. Based on these aims, the study is guided by the following research questions:

*RQ1:* Does the teaching method significantly influence on academic performance of higher education students in Cambodia?

*RQ2:* Does the teaching method significantly influence on self-regulation in Cambodian higher education institutions?

*RQ3:* Does self-regulation significantly influence on students' performance of higher education in Cambodia?

*RQ4:* Does self-regulation significantly mediate the relationship between teaching method and academic performance of higher education students in Cambodia?

The objective of this research is to explore the development of teaching method in Cambodian higher education, focusing on their effectiveness in promoting self-regulation and improving student academic performance. The study aims to examine how innovative and evidence-based instructional strategies can foster active learning, motivation, and student engagement. Additionally, it seeks to identify the institutional support—such as faculty training, infrastructure, and pedagogical research—needed to enhance teaching quality. By analyzing these elements, the research provides insights into how modern teaching approaches can contribute to a more resilient and high-performing academic environment in Cambodia.

## 2. Literature Review

The concept of teaching method in higher education encompasses a diverse range of strategies aimed at facilitating learning, fostering engagement, and promoting critical thinking. Traditional lectures remain common due to their efficiency in delivering foundational knowledge, but they often encourage passive learning. In contrast, active learning approaches—such as group discussions, case studies, and cooperative learning—have demonstrated improved comprehension, retention, and interpersonal skill development. Innovative approaches such as flipped classrooms and problem-based learning (PBL) emphasize student-centered learning by shifting the focus from traditional instructor-led teaching to active student engagement and participation. Flipped classrooms allow students to absorb content independently and use class time for practical application, while PBL fosters collaboration and real-world problem-solving skills. Technology integration—through online learning, multimedia resources, and blended learning—has expanded teaching possibilities, offering personalized and flexible learning experiences when effectively designed [10]. Experiential learning methods, including internships and simulations, bridge theory and practice, cultivating professional competencies. Effective teaching is also closely tied to instructor quality, which includes communication skills, feedback mechanisms, and the ability to build a supportive learning environment. In both online and in-person settings, engaging teaching styles enhance student motivation, participation, and academic performance. While some institutions still rely on traditional methods that emphasize rote memorization, modern educational demands call for student-centered, innovative strategies. Effective instructors tailor their methods to the subject, class size, learner characteristics, and available resources. There is growing evidence that dynamic, well-structured teaching method significantly impacts student achievement.

Students' academic performance reflects their achievements in educational settings, typically measured through grades, test scores, participation, and engagement in learning tasks [11]. It reflects the extent to which students comprehend and utilize the subject matter. Academic success is influenced by a combination of individual, social, and institutional factors, including a student's aptitude, effort, study habits, learning environment, and support systems [12]. Socioeconomic background plays a critical role in shaping academic outcomes. Students from underprivileged backgrounds often encounter financial difficulties, limited access to educational resources, and inadequate support, which can hinder their academic progress. Addressing these disparities through targeted interventions is essential to

promoting equity in higher education [13]. In addition to external factors, personal skills such as time management, goal setting, and effective study strategies are central to academic achievement. Students with strong self-regulation tend to perform better academically, while poor study habits can lead to lower outcomes. Student engagement—both academic and social—also significantly contributes to performance, as active involvement in class and extracurricular activities fosters motivation and a sense of belonging. Furthermore, institutional support, including quality teaching, academic advising, and access to learning resources, plays a pivotal role. Effective teaching practices, such as interactive learning and timely feedback, enhance the overall learning experience and academic performance.

Self-regulation is the capacity of an individual to manage and direct their thoughts, feelings, and actions in pursuit of objectives. In higher education, this skill is essential, as it enables students to manage their time effectively, remain motivated, and take responsibility for their own learning. Self-regulated learners actively plan, monitor, and evaluate their learning strategies, which contributes significantly to their academic success [14]. These students are often more proactive, resilient, and capable of adapting to challenges in their learning environments. A positive learning environment can enhance self-regulation, as it fosters motivation and supports goal-oriented behavior [15]. Zimmerman's Social Cognitive Model of Self-Regulation offers a comprehensive framework for understanding how students manage their learning processes. The model emphasizes self-efficacy—students' belief in their ability to succeed—which directly influences their motivation, goal-setting, and perseverance. High self-efficacy leads students to set ambitious goals and adopt effective learning strategies, while low self-efficacy may result in avoidance behaviors and reduced performance [16]. Zimmerman also outlines the self-regulatory cycle, which includes goal setting, self-monitoring, and self-evaluation. Students continuously assess their progress and make necessary adjustments, such as refining study strategies or seeking help, to improve outcomes. This cyclical process encourages metacognitive awareness and independence in learning, promoting sustained academic improvement over time.

### *2.1. Teaching Method and Higher Education Students' Performance*

The effectiveness of teaching method in higher education is deeply rooted in psychological and instructional theories that emphasize the interplay between learner engagement, autonomy, and perceived control. According to transactional distance theory, instructional strategies that minimize the psychological and communicative distance between instructors and students—such as interactive discussions, prompt feedback, and active learning—can significantly enhance educational outcomes [17]. These approaches foster stronger instructor-learner relationships, which are essential for sustaining student motivation and improving performance. Similarly, Self-Determination Theory highlights that when learners experience autonomy, feel competent in their tasks, and are meaningfully connected to others, their intrinsic motivation increases [18]. Teaching strategies that encourage independent thinking, provide constructive challenges, and support social interaction—such as collaborative learning and problem-based tasks—align well with these motivational principles and can contribute to greater academic achievement. In line with this, Control-Value Theory emphasizes that students' perceptions of their ability to influence their learning outcomes, and their recognition of the subject's relevance, are crucial drivers of achievement [19].

Instructional methods that offer students choices, emphasize real-world applications, and validate their academic efforts help promote both motivation and deeper cognitive engagement. Empirical studies further affirm these theoretical foundations. Effective teaching method, including the use of interactive lectures, technology-mediated instruction, and group learning, have consistently been linked to improved student comprehension, confidence, and academic performance [20]. Moreover, instructors who demonstrate approachability, creativity, and strong communication skills tend to foster more inclusive and stimulating learning environments. As higher education continues to evolve, the adoption of student-centered, theory-driven teaching method remains essential in promoting meaningful and

lasting educational outcomes. Based on the theoretical and empirical foundations discussed, it is hypothesized that:

$H_1$ : Teaching method has a significantly positive influence on students' performance of higher education in Cambodia.

## 2.2. Teaching Method and Self-Regulation

Zimmerman's Social Cognitive Model of Self-Regulation highlights self-regulation as a cyclical process involving forethought, performance, and self-reflection, shaped by interactions between personal, behavioral, and environmental factors [16]. Among these, the teaching method stands out as a key environmental influence that can significantly affect students' ability to self-regulate. Effective teaching strategies not only deliver content but also model and reinforce behaviors essential for self-regulation, such as goal setting, time management, and reflective thinking. Bandura's Social Cognitive Theory reinforces this perspective by emphasizing the importance of observational learning and social interaction [21]. In an educational setting, students learn not only from direct instruction but also by observing how their instructors manage learning tasks and by engaging with peers. Consequently, teaching method that incorporate collaborative and active learning techniques, such as project-based learning, peer instruction, and group discussion, are more likely to stimulate self-regulated learning behaviors. Research supports this theoretical framework. Zimmerman [16] asserts that instructional method that actively engage students can foster self-regulatory skills by promoting metacognitive awareness and personal responsibility for learning. Likewise, Pintrich and De Groot [22] found that students exposed to interactive and participatory teaching method exhibit higher levels of motivation and self-regulation than those in passive, lecture-based environments. Furthermore, Zheng, et al. [23] demonstrated that active learning approaches significantly enhance self-regulation among students, underscoring the broader applicability of these method across disciplines. Given this theoretical and empirical foundation, it is reasonable to propose that teaching method plays a pivotal role in shaping students' self-regulation capacities in higher education. Therefore, the following hypothesis is proposed:

$H_2$ : Teaching method has a significantly positive influence on self-regulation in Cambodian higher education institutions.

## 2.3. Self-Regulation and Higher Education Students' Performance

Self-regulation is widely recognized as a critical factor in academic success, particularly in higher education, where students are expected to manage their learning independently. Social Cognitive Theory (SCT) highlights the dynamic interaction between personal, behavioral, and environmental influences, asserting that individuals regulate their actions through mechanisms such as self-monitoring, self-evaluation, and self-reinforcement [21]. This self-regulatory capability enables students to set academic goals, track their progress, and adjust their learning strategies, ultimately enhancing performance outcomes. Complementing this perspective, Self-Determination Theory (SDT) emphasizes the role of intrinsic motivation in self-regulated behavior. According to Ryan and Deci [24] students are more likely to engage in effective self-regulation when they feel autonomous, competent, and connected to others. These psychological needs foster motivation and persistence, which are essential for navigating academic challenges. In higher education, environments that support these needs tend to produce students who are more engaged, proactive, and capable of managing their learning effectively. Zimmerman's model of self-regulation further elaborates this by identifying a cyclical process consisting of forethought, performance, and self-reflection. Students who engage in this cycle tend to plan strategically, monitor their learning behaviors, and evaluate outcomes, which contributes to improved academic performance. Research findings provide strong support for the theoretical connection between self-regulation and academic performance. For example, Credé and Kuncel [25] performed a meta-analysis of various studies and found a strong positive link between self-regulation and academic achievement across different fields of study. Similarly, Richardson, et al. [26] highlighted self-regulation as one of the most consistent predictors of academic success among

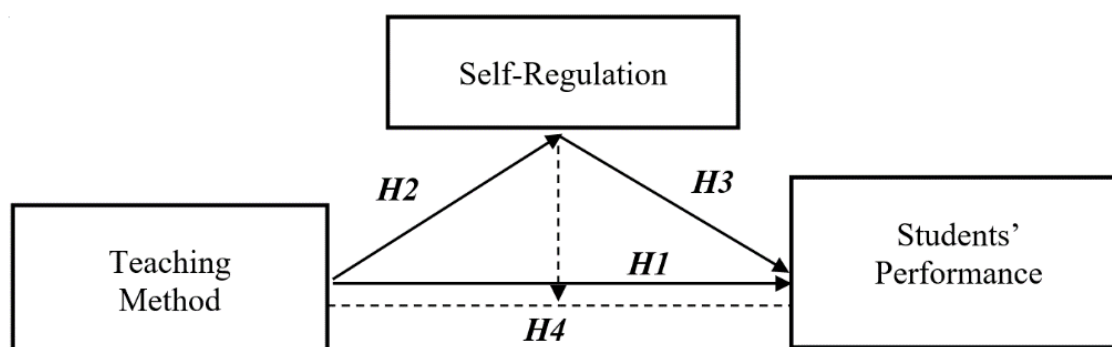
university students. Drawing from these theoretical foundations and empirical findings, the study proposes the following hypothesis:

*H<sub>3</sub>: Self-regulation has a significantly positive influence on students' performance of higher education in Cambodia.*

#### 2.4. Self-Regulation, Teaching Method and Higher Education Students' Performance

Teaching method is a central component of the learning environment and significantly shape students' academic experiences and outcomes. Rooted in Social Cognitive Theory, it is emphasized that individuals learn by observing others, imitating behaviors, and interacting with their environment, highlighting the role of social influence and contextual factors in the learning process [21]. In higher education, teaching method that foster engagement—such as interactive discussions, collaborative projects, and problem-based learning—serve as powerful environmental influences that stimulate students' self-regulatory behavior. These methods enable students to observe effective strategies, imitate them, and internalize learning behaviors that enhance academic performance. In addition, Self-Determination Theory (SDT) highlights the significance of teaching approaches that nurture students' sense of autonomy, foster competence, and promote meaningful connections with others [18]. Instructional strategies that allow students to make choices, receive constructive feedback, and work collaboratively not only motivate them but also empower them to take ownership of their learning. This autonomy-supportive approach is critical for fostering self-regulation, as students become more capable of setting goals, monitoring their progress, and adapting their learning strategies in alignment with personal and academic expectations. Social Cognitive Model of Self-Regulation also emphasizes the cyclical nature of self-regulated learning, involving forethought, performance, and self-reflection [16]. Teaching method influences each of these phases by offering opportunities for students to plan, apply, and assess their learning. For example, formative assessments and reflective activities embedded in student-centered teaching approaches prompt learners to engage in self-monitoring and adjustment of strategies. Empirical studies have found that students in classrooms with active teaching method is more likely to demonstrate strong self-regulation and improved academic outcomes. Therefore, self-regulation acts as a mediating mechanism through which teaching method impact students' performance. Based on these theoretical frameworks and empirical support, the study proposes:

*H<sub>4</sub>: Self-regulation significantly mediates the relationship between teaching method and students' performance of higher education in Cambodia.*



**Figure 1.**  
Theoretical Framework.

### 3. Research Methodology

#### 3.1. Sampling and Data Collection

The most suitable strategy to achieve the above aims is to conduct specifically descriptive research utilizing quantitative methods. In line with the findings of Rauteda [27] it is advisable to utilize

quantitative research methods in place of the previously dominant qualitative approaches. Moreover, Creswell and Guetterman [28] described the population as a group of individuals who share the same characteristics and other common features that the researcher can identify and study. Consequently, the present research focuses on lecturers from selected public and private universities in Cambodia. These public and private universities were chosen for this study for several key reasons. Additionally, Memon, et al. [29] emphasize that selecting an adequate sample size is crucial for the success of survey research.

Meanwhile, the questionnaire was meticulously developed using validated items corresponding to the study's key constructs. A pilot study was undertaken to evaluate the instrument's reliability, with Cronbach's alpha values ranging from 0.708 to 0.911, all exceeding the generally accepted minimum threshold of 0.70 [30]. Following the pilot validation, hard copies of the finalized questionnaires were distributed to all academic staff at selected public and private universities in Cambodia to ensure efficient and effective data collection. In total, 405 hard-copy questionnaires were distributed to academic staff across selected public and private higher education institutions in Cambodia. This effort yielded 347 returned surveys, representing a response rate of approximately 85.7%. After screening the responses, 27 questionnaires were excluded due to significant missing data. Consequently, 320 fully completed and valid questionnaires were retained for subsequent analysis. Thus, the overall response rate was 79%, which is considered acceptable for quantitative analysis. Table 1 provides an overview of the demographic profiles of the respondents.

**Table 1.**

The demographic characteristics of the respondents

Factors	Classification	Repetition	Proportion
Gender	Female	34	10.6
	Male	286	89.4
Age	Below 30yrs	18	5.6
	31-40yrs	52	16.3
	41-50yrs	162	50.6
	51-60yrs	81	25.3
	61yrs and above	7	2.2
Academic Qualification	MSc.	271	84.7
	PhD	49	15.3
Working Experience	Below 5yrs	28	8.8
	6 – 10yrs	47	14.7
	11 – 15yrs	166	51.9
	16 – 20yrs	68	21.3
	Above 20yrs	11	3.4
N		320	

### 3.2. Measurement

The study's primary constructs were assessed with a five-point Likert scale, where 1 represents strongly disagree and 5 represents strongly agree. The questionnaire was divided into four sections. Items addressing teaching method were designed to reflect the technological context, drawing on established frameworks. Self-regulation measures were adapted from previously validated scales, while student performance was assessed using multiple dimensions based on prior educational research.

### 3.3. Data Analysis

SmartPLS software was utilized in the present study to evaluate the proposed research framework, as it is a widely adopted tool for quantitative data analysis. Specifically, SmartPLS facilitated the assessment of the structural model, enabling the examination of the model's predictive capacity and the relationships among the constructs [31, 32]. In this study, SmartPLS 3.0 was employed to estimate both the measurement model (external model), which involved evaluating constructs' consistency and

strength, and the structural model (internal model), which assessed the hypothesized relationships between latent variables.

## 4. Research Result

### 4.1. Measurement Model Evaluation

Table 2, the reliability and validity of the constructs were confirmed using Cronbach's alpha, composite reliability (CR), AVE, and discriminant validity, following [31, 32]. All constructs demonstrated strong internal consistency ( $\alpha$  and CR > 0.90) and convergent validity (AVE > 0.69). Items with loadings between 0.70 and 0.90 were kept in the model.

**Table 2.**  
Construct Reliability and Validity.

Construct	Items	Loadings	Cronbach Alpha	Composite Reliability	Average Variance Extracted
Teaching Method	TM11	0.796	0.931	0.946	0.745
	TM12	0.818			
	TM13	0.843			
	TM14	0.842			
	TM15	0.842			
	TM3	0.798			
	TM4	0.829			
	TM5	0.827			
	TM6	0.813			
Students' Performance	SP1	0.883	0.971	0.974	0.698
	SP10	0.900			
	SP11	0.849			
	SP12	0.904			
	SP14	0.904			
	SP15	0.904			
	SP16	0.800			
	SP17	0.888			
	SP2	0.750			
	SP3	0.720			
	SP4	0.739			
	SP5	0.720			
	SP6	0.747			
	SP7	0.888			
	SP8	0.902			
	SP9	0.824			
Self-Regulation	SR1	0.917	0.931	0.946	0.745
	SR2	0.905			
	SR3	0.816			
	SR4	0.790			
	SR5	0.819			
	SR6	0.922			

Table 3, discriminant validity was confirmed using the Fornell–Larcker criterion, ensuring that each construct is empirically distinct. The square root of the AVE for each construct teaching method (0.823), Self-Regulation (0.863), and students' performance (0.836) exceeded its correlations with other

constructs, meeting the threshold proposed by Fornell and Larcker [33]. These results support the discriminant validity and integrity of the measurement model [31, 32].

**Table 3.**  
Latent Variable Correlations (Fornell-Larcker Criterion)

Constructs	TM	SR	SP
Teaching Method (TM)	0.823		
Self-Regulation (SR)	0.492	0.863	
Students' Performance (SP)	0.300	0.332	0.836

Table 4, discriminant validity was further supported using the Heterotrait-Monotrait Ratio (HTMT), with all values below the 0.90 threshold [34]. Specifically, the values for SR–TM (0.524), SP–TM (0.311), and SP–SR (0.348) indicate a clear distinction among the constructs, thereby supporting strong discriminant validity within the measurement model.

**Table 4.**  
Discriminant Validity (Heterotrait-Monotrait Ratio - HTMT).

Constructs	TM	SR	SP
Teaching Method (TM)			
Self-Regulation (SR)	0.524		
Students' Performance (SP)	0.311	0.348	

#### 4.2. Structural Model Evaluation

After confirming the validity of the measurement model, the  $R^2$  values were examined to determine how well the exogenous variables explain the endogenous constructs. Higher  $R^2$  values reflect greater explanatory power. Chin [35] classifies  $R^2$  values as substantial when they exceed 0.67, moderate if they fall between 0.33 and 0.67, weak within the range of 0.19 to 0.33, and undesirable if they are below 0.19. Table 5 presents the structural model indicators. The model accounts for 24.2% of the variance in Self-Regulation and 13.5% of the variance in students' performance, as indicated by the  $R^2$  values. These values suggest the model has a very weak explanatory power, which is accepted. The adjusted  $R^2$  values (0.240 and 0.129, respectively) confirm the robustness of these results while adjusting for the number of predictors in the model.

**Table 5.**  
Coefficient of Determination (R Square).

Constructs	R-square	R-square adjusted
Self-Regulation	0.242	0.240
Students' Performance	0.135	0.129

Furthermore, the  $f^2$  effect sizes were assessed to evaluate how much each independent variable contributed to the  $R^2$  value of the dependent constructs, using [36] benchmarks where values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively. The effect size ( $f^2$ ) analysis reveals that self-regulation has a small impact on students' performance ( $f^2 = 0.052$ ), while teaching method has only a small effect ( $f^2 = 0.028$ ) on students' performance. Additionally, teaching method exerts a moderate effect on self-regulation ( $f^2 = 0.319$ ) in Table 6.

**Table 6.**  
Effect Sizes ( $f^2$ ) Analysis.

Students' Performance	Effect Size	Decisions
Teaching Method	0.028	Small
Self-Regulation	0.052	Small
Self-Regulation	Effect Size	Decisions
Teaching Method	0.319	Moderate

Furthermore,  $Q^2$  values were derived using the blindfolding procedure to evaluate the model's predictive relevance; values greater than zero suggest that the model has sufficient predictive accuracy [34]. The  $Q^2$  values of the endogenous constructs suggest that the model has accurate predictive relevance. Specifically, the  $Q^2$  for students' performance is 0.092, reflecting a minimum criterion for predictive relevance but indicates a relatively weak predictive capacity. The  $Q^2$  value of 0.177 for self-regulation suggests that the model demonstrates a small to moderate level of predictive relevance for this latent variable. While the value does not reach the threshold for moderate predictive strength. Since both values exceed the threshold of Zero, it can be concluded that the model exhibits acceptable predictive relevance for these constructs in Table 7.

**Table 7.**

Construct Cross Validated Redundancy ( $Q^2$ ).

Constructs	SSE	SSO	1-SSE/SSO
Self-Regulation	1,920.000	1,579.776	0.177
Students' Performance	5,120.000	4,651.475	0.092

**Note:** SSO - Systematic Sources of Output; SSE - Systematic Sources of Error.

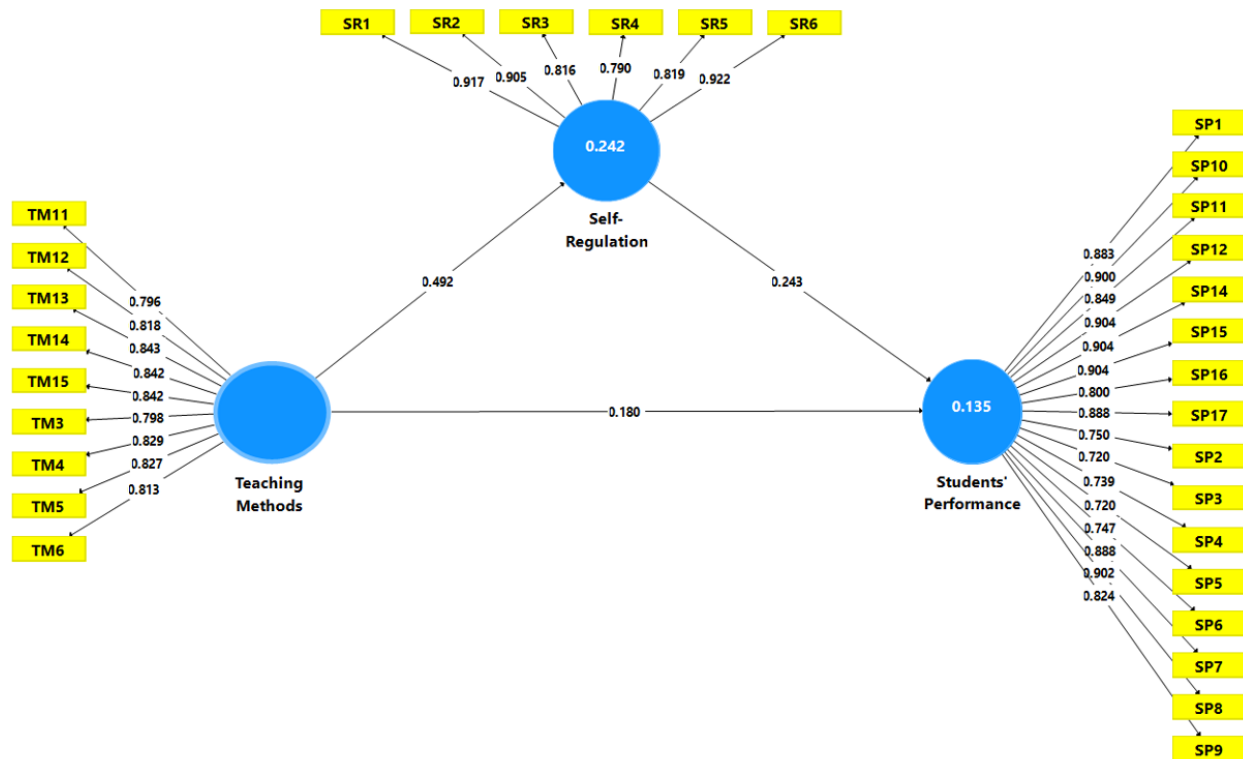
Thus, with SRMR values of 0.075 for both the saturated and estimated models—falling below the recommended threshold of 0.10—it can be concluded that the model demonstrates a good overall fit [31, 32]. The structural model indicators are summarized in Table 8.

**Table 8.**

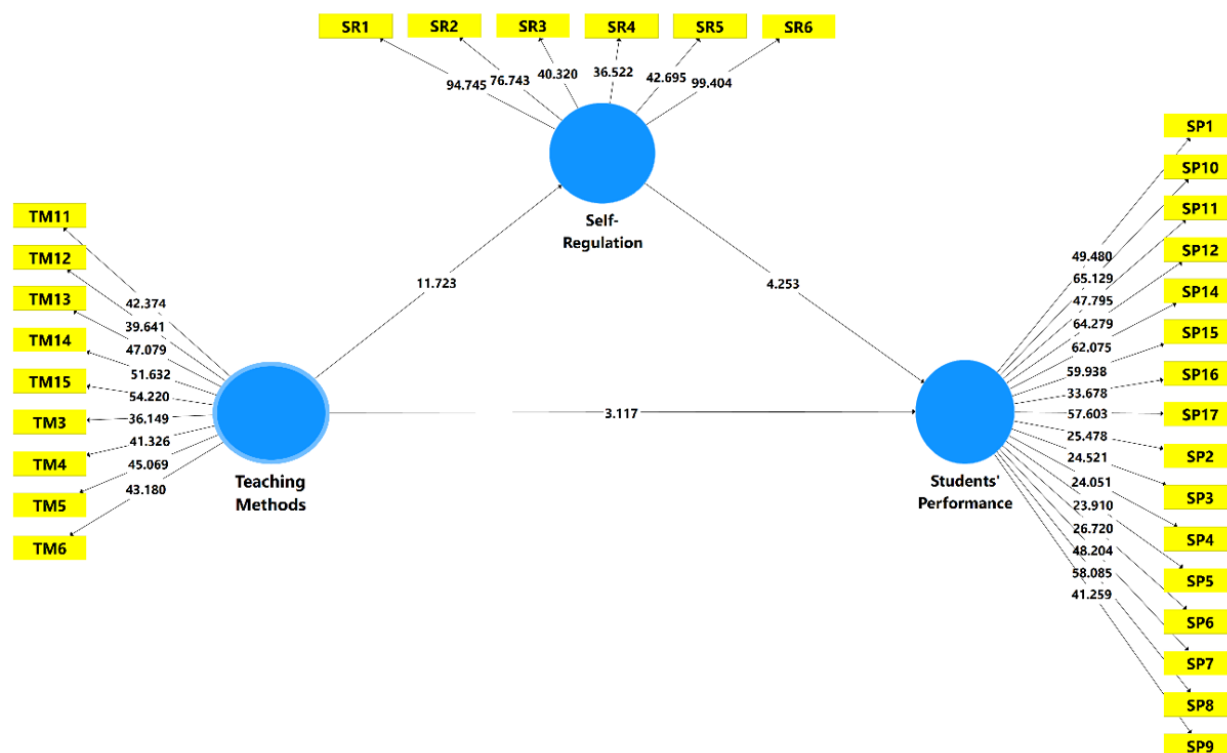
Goodness of Fit of The Model.

Item	Saturated Model	Estimated Model
SRMR	0.075	0.075
d_ULS	2.786	2.786
d_G	8.790	8.790
Chi-Square	8,139.546	8,139.546
NFI	0.525	0.525

### 4.3. Hypothesis Testing



**Figure 2.**  
Path Model Significant.



**Figure 3.**  
Path Model Results of Mediation.

Table 9 shows the analysis revealed a positive and statistically significant direct effect of teaching method on students' performance ( $\beta = 0.183$ ,  $t = 2.907$ ,  $p = 0.004$ ). This finding supports *H1*. A strong, positive effect was found between teaching method and self-regulation ( $\beta = 0.491$ ,  $t = 12.432$ ,  $p = 0.000$ ), indicating that pedagogical approaches substantially influence students' ability to self-regulate their learning processes. *H2* is therefore supported. The results also support *H3*, with self-regulation exerting a significant positive effect on students' performance ( $\beta = 0.242$ ,  $t = 3.867$ ,  $p = 0.000$ ). The indirect path from teaching method to students' performance through self-regulation was statistically significant ( $\beta = 0.119$ ,  $t = 3.633$ ,  $p = 0.000$ ), confirming a significant mediating effect. This finding provides empirical support for *H4*.

**Table 9.**  
Direct and Indirect Effect Hypotheses Testing

Hypothesis	Coef.	Se	T value	P values	Decision
Teaching Method -> Students' Performance	0.183	0.062	2.907	0.004	Supported
Teaching Method -> Self-Regulation	0.491	0.040	12.432	0.000	Supported
Self-Regulation -> Students' Performance	0.242	0.063	3.867	0.000	Supported
Teaching Method -> Self-Regulation -> Students' Performance	0.119	0.033	3.633	0.000	Supported

**Note:** Coef. = Coefficient; se = standard error.

## 5. Discussion and Conclusion

### 5.1. Discussion

This study examined the relationships between teaching method, self-regulation, and students' academic performance in Cambodian higher education. Using Partial Least Squares Structural Equation

Modeling (PLS-SEM), all four hypotheses ( $H1-H4$ ) were statistically supported, indicating both direct and indirect influences of teaching method on students' performance.

The results demonstrate a positive and significant direct effect of teaching method on students' academic performance ( $\beta = 0.183$ ,  $t = 2.907$ ,  $p = 0.004$ ), thereby confirming  $H1$ . This finding is consistent with Ahmad, et al. [37] who reported that the adoption of effective instructional methods significantly enhances university students' academic outcomes. The current study reinforces the importance of teaching method that actively engage learners, promote conceptual understanding, and support performance, particularly within the context of higher education.

The analysis revealed a strong and statistically significant relationship between teaching method and self-regulation ( $\beta = 0.491$ ,  $t = 12.432$ ,  $p = 0.000$ ), thereby supporting  $H2$  and highlighting the pivotal role of instructional design in cultivating students' self-regulatory capacities. This finding aligns with Doo and Bonk [38] who demonstrated that effective teaching strategies—particularly within flipped learning environments—can significantly enhance learners' self-efficacy, self-regulation, and engagement. The current result underscores the transformative potential of learner-centered pedagogies in promoting autonomous learning behaviors essential for academic success in higher education.

The results indicate that self-regulation exerts a significant positive effect on students' academic performance ( $\beta = 0.242$ ,  $t = 3.867$ ,  $p = 0.000$ ), confirming  $H3$  and emphasizing the central role of self-directed learning in academic achievement. This finding aligns with Park and Kim [39] who found that self-regulation improves engagement and performance in flipped learning, and with Figueiredo, et al. [40] who emphasized the link between self-efficacy and academic success in higher education. Together, these results highlight the importance of embedding self-regulatory skill development into instructional design to promote academic resilience and consistent performance.

Self-regulation significantly mediates the relationship between teaching method and students' performance ( $\beta = 0.119$ ,  $t = 3.633$ ,  $p = 0.000$ ), providing support for  $H4$ . This result reinforces the critical role of learner autonomy and engagement in contemporary pedagogical models. Consistent with Sun [41] who found that learner autonomy positively influences academic outcomes among Cambodian university students, and Park and Kim [39] who demonstrated that self-regulation enhances student engagement and performance in flipped learning environments, the current findings suggest that instructional strategies fostering self-directed learning are pivotal in optimizing academic success. These results underscore the need for teaching approaches that actively develop students' regulatory skills within learner-centered frameworks.

## 5.2. Conclusion

This study examined the relationship between teaching method, self-regulation, and students' performance in higher education, with a focus on Cambodian universities. The findings affirm that effective teaching method significantly enhance student academic performance both directly and indirectly through their influence on self-regulation. Self-regulation was shown to be a key factor contributing to improved learning outcomes, acting as a mediator between teaching method and students' performance. The results highlight the importance of pedagogical approaches that actively foster self-regulatory behaviors, such as goal setting, self-monitoring, and reflective learning. The model demonstrated acceptable reliability, validity, and overall fit, suggesting the robustness of the research framework. These outcomes support the theoretical propositions grounded in Social Cognitive Theory and Self-Determination Theory, emphasizing the interconnected roles of instructional practices and student agency in academic success.

However, the study has certain limitations. Its focus on a single cultural and educational context may limit the generalizability of the results to other settings. Additionally, using self-reported data to assess self-regulation may lead to potential bias or inaccuracies in the results. Future research should

explore these relationships across different educational systems, apply longitudinal methods, and utilize more objective assessments to strengthen the findings.

### Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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