

MOTIVATION AS A MEDIATOR BETWEEN TIME MANAGEMENT, SELF-REGULATED LEARNING, AND STUDENT PERFORMANCE IN ONLINE LEARNING: EVIDENCE FROM MALAYSIAN PRIVATE HIGHER EDUCATION INSTITUTIONS

Hoon San Tang ¹

Seow Ai Na ^{2*}

Lam Siew Yong ³

¹ Teh Hong Piow Faculty of Business and Finance, Universiti Tunku Abdul Rahman, Kampar 31900, Perak, Malaysia (Email: hoonsan98@utar.my)

² Associate Professor: Teh Hong Piow Faculty of Business and Finance, Universiti Tunku Abdul Rahman, Kampar 31900, Perak, Malaysia (Email: seowan@utar.edu.my)

³ Assistant Professor: Teh Hong Piow Faculty of Business and Finance, Universiti Tunku Abdul Rahman, Kampar 31900, Perak, Malaysia (Email: lamsy@utar.edu.my)

*Corresponding author: seowan@utar.edu.my

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Abstract: *This study investigates the mediating role of motivation between time management, self-regulated learning (SRL) and student performance in online learning among Malaysian private higher education institutions (PHEIs). Data from 350 valid responses were analysed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings show that motivation is influenced by both time management and SRL, which in turn predict student performance. Additionally, motivation was found to fully mediate the relationships between time management and performance, and between SRL and performance. These findings highlight the importance of effective time management and self-regulation in strengthening students' motivation and online learning performance in Malaysian PHEIs.*

Keywords: *Motivation, Time Management, Self-Regulated Learning, Student Performance, Online Learning, Self-Determination Theory, Malaysian Higher Education*

Introduction

Globally, the quick uptake of online education has revolutionised higher education, especially in the wake of the COVID-19 pandemic. To guarantee learning continuity and flexibility, Malaysian higher education institutions including private higher education institutions (PHEIs) have progressively included online learning into their curricula. While accessibility and flexible learning options are advantages of online learning, students must take on more responsibility for their own learning, which may have an impact on their academic achievement (Ryan & Deci, 2020; Sun et al., 2023). Malaysian PHEIs typically enroll students from a variety of educational and socioeconomic backgrounds and prioritise technology-enhanced and flexible learning over public universities, they offer a distinctive backdrop for this study. As a result, in order to thrive in online settings, PHEI students must exhibit greater levels of learner autonomy, self-management, and independent learning (Teo et al., 2023). Even while these abilities are crucial, efficient time management and SRL may not necessarily result in better academic achievement. Students may still perform poorly if they are not motivated enough to regularly follow their study schedules. Similarly, when motivation is low, students may understand and use SRL procedures but be unable to maintain these behaviour. These difficulties are more noticeable in online learning settings, where students must sustain their own motivation, engagement, and perseverance due to the lack of instructor supervision (Li et al., 2023; Zheng & Xiao, 2024).

Few studies have looked at motivation as the mediating mechanism through which time management and SRL affect student performance, especially among students in Malaysian PHEIs, despite the fact that prior research has established the individual relationships between time management, SRL, motivation, and student performance. Understanding this mechanism could help explain why some students who have effective learning strategies yet perform poorly academically when learning online. This is a significant theoretical and empirical gap. Thus, among undergraduate students at Malaysian PHEIs, this study examines the mediating function of motivation in the relationship between time management, SRL, and student performance. The goal of the research, which is guided by Self-Determination Theory, is to expand knowledge of how motivation helps successful learning behaviors translate into greater academic performance in online learning environments. Therefore, the present study aims to fill this gap by investigating how time management and SRL influence student performance in online learning environments, with motivation serving as a mediating variable. The study focuses on undergraduate students enrolled in Malaysian PHEIs and seeks to answer the following research questions:

1. How do time management and self-regulated learning affect motivation in online learning environments in Malaysian PHEIs?
2. How does motivation affect students' performance in online learning environments?
3. Does motivation mediate the effects of time management and self-regulated learning on student performance?

Literature Review

Ryan and Deci's (2020) Self-Determination Theory (SDT) offers the theoretical framework for comprehending how motivation affects students' performance and learning behaviors. According to SDT, when student's core psychological requirements for relatedness, competence, and autonomy are met, they are more likely to develop autonomous motivation. Compared to controlled types of motivation, autonomous motivation enables students to participate voluntarily in learning activities, persevere in the face of difficulties, and produce better academic results (Ryan & Deci, 2020; Deci & Ryan, 2022). SDT has become one of the

most popular theories for explaining students' motivation and academic success in technology-mediated learning environments because online learning necessitates that student take more responsibility for planning, monitoring, and evaluating their learning with little instructor supervision. Although they indicate that both learning behaviors and the learning environment have an impact on motivation, recent empirical research largely supports the use of SDT in online learning. According to research by Al Mamun et al. (2023) and Zhou and Zhang (2024), learning environments that promote students' autonomy, offer helpful criticism, and foster meaningful interaction boost autonomous motivation, which in turn boosts academic engagement and performance. However, Alberts et al. (2024) contended that if students are unable to control their own learning behaviors, supportive learning environments by themselves cannot ensure good learning outcomes. These results show the significance of combining behavioral and motivational approaches since they imply that students' ability to effectively monitor and regulate their learning influences motivation in addition to instructional design.

According to SDT, SRL and time management are behavioral strategies that help students meet their psychological requirements and become self-motivated. Effective time management increases the likelihood that students will feel more in charge of their learning activities, which will boost their sense of autonomy. Similarly, students are more likely to gain competence and self-assurance in their academic skills if they create learning objectives, track their progress, and assess their learning results. SDT states that meeting these psychological requirements increases autonomous motivation, which in turn encourages increased engagement, perseverance, and academic success (Ryan & Deci, 2020; Li et al., 2023; Zheng & Xiao, 2024). However, prior empirical research has mostly focused on the direct connections between time management, SRL, motivation, and student performance; motivation as the mechanism by which these learning behaviors affect academic outcomes has received comparatively little attention. Because SDT explains the psychological mechanism that connects learning behaviors to student performance, it offers a suitable theoretical basis for the current investigation. SDT proposes that time management and SRL first increase students' autonomous motivation, which then leads to higher academic performance, rather than thinking that these behaviors directly boost academic achievement. This theoretical viewpoint offers a logical explanation for the relationship between time management, SRL, motivation, and student performance in online learning environments within Malaysian private higher education institutions. It also supports the suggested mediating role of motivation.

Proposed Conceptual framework

This study proposes a mediation model in which motivation serves as the mediating variable linking two key independent variables, time management and SRL, to the dependent variable, student performance in online learning environments. The conceptual framework is grounded in Self-Determination Theory (SDT) developed by Ryan and Deci (2000), which posits that fulfilling learners' basic psychological needs for autonomy, competence, and relatedness enhances intrinsic motivation and academic engagement.

In the context of online learning in PHEIs, time management and SRL are viewed as essential competencies that empower students to take ownership of their learning process. When students effectively manage their time and apply SRL strategies such as goal setting, self-monitoring, and reflection, they are more likely to feel competent and autonomous, two psychological drivers that SDT identifies as precursors to intrinsic motivation. In turn, higher levels of motivation are expected to lead to increased engagement, sustained effort, and ultimately, improved student performance (Yusuf et al., 2023).

The proposed framework, as illustrated in Figure 1, reflects these hypothesised relationships. It emphasises that while time management and SRL may contribute directly to student performance, their effects are significantly channelled through motivation. This conceptualisation allows for a more nuanced understanding of how psychological and behavioural factors interact to influence student performance in online learning environments.

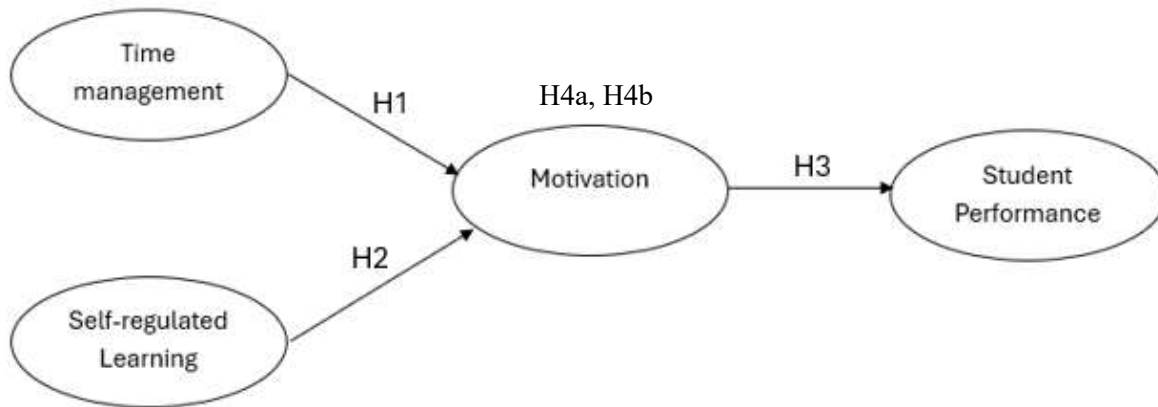


Figure 1: The proposed conceptual framework

Hypotheses Development

Time management and motivation

In online learning environments, time management is posited to have a positive relationship with motivation. According to Self-Determination Theory (SDT) (Ryan & Deci, 2000), students who effectively plan, prioritise, and allocate time for academic tasks are more likely to experience feelings of competence and autonomy, which in turn foster intrinsic motivation. This is particularly relevant in online learning contexts, where students are responsible for regulating their schedules without the structure of face-to-face classes. Empirical studies in Malaysian higher education support this theoretical linkage. Hashim et al. (2023) found that students who demonstrated strong time management skills reported significantly higher levels of motivation, largely because their ability to stay organised reduced academic stress. Conversely, poor time management, manifesting procrastination, missed deadlines, or chaotic study routines have been associated with decreased motivation, increased frustration, and anxiety (Lim et al., 2022). In addition, intervention studies have shown that helping students adopt structured time management strategies leads to greater motivation. For instance, Abdullah et al. (2023) reported that when students were taught to break tasks into smaller, manageable parts and set realistic deadlines, their motivation in online learning environments improved substantially. This is likely due to the enhanced sense of progress and accomplishment such strategies provide. Based on these findings, this study hypothesises the following:

H₁: Time management is positively related to motivation.

Self-regulated learning and motivation

This study posits that students who employ effective SRL strategies are more likely to exhibit higher levels of motivation in online learning environments. Grounded in Zimmerman's (2000) SRL Theory, SRL involves students actively engaging in goal setting, self-monitoring, strategy adjustment, and self-reflection to manage their learning. These behaviours are particularly critical in online settings, where learning is often self-paced and instructor supervision is

minimal. According to SDT (Ryan & Deci, 2000), SRL fosters motivation by satisfying the learner's basic psychological needs for competence, autonomy, and relatedness. When students effectively regulate their learning, they gain a greater sense of control over their academic progress and feel more capable of achieving their goals, which in turn enhances intrinsic motivation.

Empirical evidence from Malaysian higher education supports this theoretical relationship. Yusuf et al. (2023) found that motivation driven by SRL strategies was essential for maintaining engagement in asynchronous online courses. Similarly, Tan and Lee (2023) reported that students with strong SRL capabilities exhibited higher motivation levels due to their ability to monitor progress and adjust learning strategies when necessary. In contrast, students lacking SRL strategies often experience disorganisation, frustration, and a decline in motivation, which negatively impact their student performance (Rashid et al., 2023). Based on these theoretical and empirical foundations, the following hypothesis is proposed:

H_2 : Self-regulated learning is positively related to motivation.

Motivation and student performance

This study postulates that motivation is a key predictor of student performance in online learning environments, as informed by SDT (Ryan & Deci, 2000). According to SDT, intrinsically motivated students driven by curiosity, a desire for mastery, and personal growth are more likely to engage meaningfully with learning content, persist through challenges, and ultimately perform better academically. Recent empirical research supports this proposition. In the context of Malaysian online higher education, Chen et al. (2024) emphasised that motivated learners exhibit higher levels of cognitive engagement and are more likely to adopt deep learning strategies, which lead to improved academic outcomes. Similarly, Abdullah et al. (2023) found that intrinsically motivated students reported GPA scores approximately 20% higher than those of extrinsically motivated peers. These students tended to spend more time on self-directed study, actively sought feedback, and demonstrated sustained interest in learning. Conversely, students with low motivation, particularly those reliant on external rewards such as grades or approval, were found to exhibit surface-level learning behaviours and lower overall performance. Lim and Tan (2024) reported that such students experienced higher rates of disengagement and dropout, as well as lower academic achievement, due to their limited emotional investment in learning tasks.

Taken together, these findings underscore the central role of motivation in shaping students' academic success in online learning environments. Therefore, the following hypothesis is proposed:

H_3 : Motivation is positively related to student performance.

The mediating role of motivation

This study proposes that motivation mediates the relationship between time management and SRL, and student performance in online learning environments. This hypothesis is grounded in SDT (Ryan & Deci, 2000), which highlights the importance of internal psychological needs in driving learning behaviours and achievement. According to these frameworks, students who demonstrate effective time management and SRL strategies are more likely to experience increased feelings of competence, autonomy, and self-efficacy, key components that enhance intrinsic motivation (Ryan & Deci, 2020; Deci & Ryan, 2022). This elevated motivation, in

turn, facilitates deeper engagement with learning materials, greater persistence in completing tasks, and ultimately, improved student performance (Li et al., 2023; Sun et al., 2023; Zeng et al., 2023).

Motivation and Time Management

Time management has long been recognised as a critical skill influencing student performance, particularly in higher education settings, where students are expected to manage their learning independently (Trueman & Hartley, 1996). Students who efficiently organise their academic schedules and tasks often experience reduced stress levels and enhanced productivity, which positively impacts their performance (Wang et al., 2023). In online learning environments, time management is becoming recognised as a critical internal component of student performance. For instance, when forced to participate in online learning, many Malaysian undergraduates had trouble in managing study schedules as well as maintain positive learning attitudes (Nesamalar et al., 2023). The relationship between motivation and time management has also been studied. According to students' assessments of how time management techniques support their online learning, there is a substantial positive correlation between students' time management abilities and their levels of motivation and efficiency in online learning environments (Ahmad et al., 2023). This emphasises how effective time management affects psychological elements called motivational states in addition to performance.

However, the relationship between time management and student performance may not be entirely direct. Motivation, defined as the internal process that initiates, directs, and sustains goal-directed behaviour (Deci & Ryan, 2013; Schunk et al., 2014), may serve as a key mediating mechanism. Motivated students are more likely to value the efficient use of their time, thereby increasing the consistency and quality of their academic work. For instance, Ahmad et al. (2022) and Kim and Lim (2024) found that students with high motivation were more intentional in applying time management strategies, resulting in stronger academic outcomes. Karunanidhi and Chitra (2021) similarly concluded that the impact of time management on academic progress was significantly amplified when students possessed high levels of motivation. Based on these findings, the following hypothesis is proposed:

H_{4a} : The positive relationship between time management and student performance is mediated by motivation.

Motivation and Self-regulated Learning

SRL refers to a set of behavioural, motivational, and metacognitive strategies that enable learners to take control of their education (Zimmerman, 2002; Schunk et al., 2014). It has been linked to student performance as students who effectively plan, monitor, and evaluate their learning processes tend to be more academically successful (Wang et al., 2023). However, motivation plays a critical role in enabling the consistent and purposeful application of SRL strategies. Kleimola et al. (2025) examine students' use of dashboards to assist the reflection, performance, and foresight phases of SRL. Education data overviews have been shown to improve SRL by increasing students' awareness of their own learning, which in turn boosts motivation and could be a predictor of improved performance. Additionally, students who were able to control their effort, study time, and self-regulation performed noticeably better academically in online learning environments than those who were not. This increases SRL's significance as an internal component (Junaščíková, 2024).

Motivation is a crucial psychological component that has a close relationship with performance and is influenced by SRL. Students with higher levels of motivation are more likely to engage in self-regulated behaviours deliberately and persistently (Deci & Ryan, 2012). Recent studies have shown that motivation not only directly influences student performance but also mediates the relationship between SRL and academic outcomes. Kocak and Bayram (2022) and Kim and Lee (2023) provided empirical evidence that students with strong SRL skills perform better primarily because they are highly motivated. For example, Lee and Huang (2022) found that motivation helped students with advanced SRL techniques stay committed to achieving their academic goals, thereby improving their performance. This suggests that SRL strategies may be less effective in the absence of sufficient motivational drive. As such, the current study proposes the following hypothesis:

H_{4b} : The positive relationship between self-regulated learning and student performance is mediated by motivation.

Research Methodology

Target population, data collection and sampling

Undergraduate students enrolled in Malaysian PHEIs who have prior experience with online or hybrid learning made up the study's target group. At the end of 2024, a Google Forms administered online survey was used to gather data. To find respondents who fit the study's inclusion requirements, purposeful sampling was used. Three screening questions were used to validate respondent eligibility: (1) were undergraduate students; (2) were enrolled in a PHEIs in Malaysia; and (3) had prior experience with online or hybrid learning. Nine Malaysian PHEIs, including Multimedia University (MMU), Universiti Tunku Abdul Rahman (UTAR), Universiti Tenaga Nasional (UNITEN), Universiti Teknologi PETRONAS (UTP), HELP University, UNITAR International University, SEGi University, MAHSA University, and Nilai University participated in the survey via student representatives, university social media platforms, and online student networks. These universities offer a varied sample of undergraduate students from Malaysia's private higher education sector. Table 1 displays the respondents' demographic information.

Table 1. Descriptive Statistics

Full Sample = 350 Respondents			
		Frequency	Percentage
Age	20-21	55	15.7%
	22-23	184	52.6%
	24-25	111	31.7%
Gender	Male	83	23.7%
	Female	267	76.3%
Ethnic Group	Malay	72	20.6%
	Chinese	180	51.4%
	Indian	98	28.0%
Year of Study	Bachelor's Degree (Year 1)	13	3.7%
	Bachelor's Degree (Year 2)	132	37.7%
	Bachelor's Degree (Year 3)	162	46.3%
	Bachelor's Degree (Year 4)	43	12.3%

Questionnaire Design

A questionnaire with three sections was used to gather data from undergraduate students at Malaysian PHEIs. To make sure responders fulfilled the study's inclusion requirements, Section A included screening questions. Student performance, motivation, time management and SRL were the four research components that were examined in Section B using previously validated measuring items that were modified from well-established studies. Five items on a five-point Likert scale, from 1 ("Strongly Disagree") to 5 ("Strongly Agree"), were used to measure each construct. Table 2 lists the sources of the measurement items for each construct, whereas Appendix A contains all of the measuring items. The demographic data of the respondents, such as age, gender, ethnicity, and year of study, was gathered in Section C.

The questionnaire completed a pre-test and pilot research before the main survey to guarantee its reliability, content validity, and clarity. Five academic experts participated in the pre-test and evaluated the questionnaire's phrasing, content relevancy, and appropriateness for the online learning environment. Thirty undergraduate students from Malaysian PHEIs participated in pilot research to evaluate the instrument's viability and internal consistency. All constructs obtained Cronbach's alpha values above the suggested cutoff of 0.70 (Hair et al., 2022).

Table 2: Sources of measurement items

Construct	Number of items	Scale	Adapted from
Student performance	5	5-point Likert	Kasantra et al. (2013) and Realyvásquez-Vargas et al. (2020).
Motivation	5	5-point Likert	Wang et al. (2013), Beluce & Oliveira (2015), Cullum (2016), Fowler (2007).
Time management	5	5-point Likert	Wang et al. (2013) and Alyami et al. (2021).
Self-regulated learning	5	5-point Likert	Wang et al. (2013).

Data analysis and results

A two-software approach was employed: SmartPLS 4 for evaluating structural models and testing hypotheses, and SPSS for descriptive statistics, demographics, and reliability assessments such as Cronbach's alpha. SmartPLS-SEM was chosen due to its capacity to manage intricate latent constructs and mediation effects (Becker et al., 2023; Nallaluthan et al., 2024).

Measurement model assessment

The evaluation of the measurement model began with an examination of outer loadings, which indicate the strength of the relationship between each indicator and its associated latent construct. Following the guidelines of Sarstedt et al. (2022), loadings greater than 0.708 were considered ideal, as they imply that the latent construct explains more than 50% of the variance in the corresponding indicator. A few indicators with loadings between 0.60 and 0.70 were retained due to their theoretical relevance, consistent with recommendations in the literature (Hair et al., 2022; Kline, 2023; Awang, 2024). All retained items met the minimum acceptable threshold for inclusion.

To assess internal consistency reliability, both Cronbach's alpha and composite reliability (CR) were examined. While Cronbach's alpha values exceeded the 0.70 benchmark, with most constructions scoring above 0.80, indicating acceptable to strong reliability, CR was prioritised

due to its ability to account for the differential contribution of item loadings (Henseler et al., 2022). All constructs demonstrated strong composite reliability, with CR values exceeding 0.80, confirming the consistency of the measurement items (Sarstedt et al., 2021).

Convergent validity was evaluated using the Average Variance Extracted (AVE). According to Fornell and Larcker (1981), an AVE value of 0.50 or higher indicates that, on average, the construct explains more than half of the variance of its indicators after accounting for measurement error. All constructs in this study achieved AVE values above the 0.50 threshold, thus confirming convergent validity.

These results confirm the reliability and convergent validity of all measurement constructs used in the model. Table 3 presents the outer loadings, Cronbach's alpha, composite reliability, and AVE values for each construct included in the study.

To assess discriminant validity, the study employed the heterotrait-monotrait ratio of correlations (HTMT), which has become the preferred method in contemporary structural equation modelling (SEM) due to its superior sensitivity and specificity (Henseler et al., 2022). According to Sarstedt et al. (2021), HTMT values below the conservative threshold of 0.85 provide strong evidence that the constructs are empirically distinct. As shown in Table 4, the HTMT values ranged from 0.798 to 0.875. Although two values slightly exceeded the conservative threshold of 0.85, all remained below 0.90 (Henseler et al., 2015). Therefore, discriminant validity is considered acceptable.

Table 3: Convergent Validity Result

Constructs	Items	Outer loadings	Alpha	CR	AVE
SP	SP1	0.905	0.868	0.886	0.660
	SP2	0.709			
	SP3	0.669			
	SP4	0.844			
	SP5	0.903			
MT	MT1	0.812	0.850	0.856	0.627
	MT2	0.724			
	MT3	0.828			
	MT4	0.742			
	MT5	0.846			
TM	TM1	0.767	0.871	0.885	0.653
	TM2	0.811			
	TM3	0.854			
	TM4	0.777			
	TM5	0.829			
SRL	SRL1	0.797	0.880	0.884	0.678
	SRL2	0.880			
	SRL3	0.842			
	SRL4	0.734			
	SRL5	0.854			

Note. SP = Student Performance, MT = Motivation, TM = Time Management, SRL = Self-regulated Learning

Table 4: Discriminant validity – Heterotrait-Monotrait Ratio (HTMT)

	MT	SRL	SP	TM
MT				
SRL	0.839			
SP	0.841	0.875		
TM	0.815	0.798	0.858	

Note. SP = Student Performance, MT = Motivation, TM = Time Management, SRL = Self-regulated Learning

Structural Model Analysis

The findings show that motivation is positively and significantly impacted by time management ($\beta = 0.185$, $t = 9.776$, $p < .001$). According to this research, students who successfully manage their time are more likely to continue to be highly motivated in their academic pursuits. Therefore, H₁ is supported. Additionally, motivation is favorably and significantly influenced by SRL ($\beta = 0.828$, $t = 48.396$, $p < .001$). This finding shows that students who successfully manage their learning processes including organising, observing, and assessing their learning activities tend to be more motivated. SRL is a significant antecedent of motivation. Thus, SRL has a significant positive effect on motivation, supporting H₂. Similarly, student performance is positively impacted by motivation ($\beta = 0.888$, $t = 75.294$, $p < .001$). This result suggests that better student performance is linked to higher levels of motivation. According to the study setting, motivation is a significant predictor of student performance, as indicated by the substantial path coefficient. As a result, H₃ is also supported.

Table 5: The results of Path Coefficients

Hypotheses	Path Coefficient	t-values	p-values	Results
MT → SP	0.888	75.294	0.000	Supported
SL → MT	0.828	48.396	0.000	Supported
TM → MT	0.185	9.776	0.000	Supported

Note. SP = Student Performance, MT = Motivation, TM = Time Management, SRL = Self-regulated Learning

Testing the mediation effect of Motivation

The mediating role of motivation was assessed to determine whether it significantly explains the relationships between the exogenous constructs, time management and SRL and the endogenous outcome, student performance, in online learning environments. Following the methodological recommendations of Hair et al. (2022) and Henseler et al. (2022), the mediation analysis utilised bootstrapping procedures and Variance Accounted For (VAF) to test indirect effects within the PLS-SEM framework.

The coefficient value of 0.185 suggests that time management positively affects motivation and student performance. The relationship is statistically significant, as indicated by the p-value of 0.000 ($p < 0.05$). As a result, the time management hypothesis is validated. Most of the relationship between time management and student performance may be explained by motivation, according to the Variance Accounted For (VAF) value of 88%. Full mediation is suggested because the VAF value is greater than 80%. To put it another way, motivation is a key mediator between student performance and time management. This implies that students who are adept at managing their time are more likely to develop motivation, which greatly enhances performance.

SRL and motivation are strongly positively correlated, as indicated by the correlation of 0.828. The statistical significance of the link is shown by the p-value of 0.001. The relationship between SRL and student performance is significantly mediated by motivation, as indicated by the VAF value of 88%, which also shows full mediation. This implies that students who can control and manage their own learning process typically become more motivated, which enhances their performance.

The coefficient value of 0.888 indicates that student performance is strongly positively impacted by motivation. The mediation effect is statistically significant, according to the p-value of 0.001. This result suggests that student performance is significantly influenced by motivation. Improved student performance is linked to higher student motivation levels.

With a VAF value of 88%, the mediation study showed that motivation completely mediates the relationship between time management, SRL, and student performance. Both independent factors have a significant impact on student performance through motivation, according to the significant p-values ($p < 0.001$) (Qin, 2024). Thus, developing students' SRL techniques and time management abilities can boost motivation, which in turn improves student performance.

The findings of the mediation show that motivation completely mediates the connections between SRL and student performance as well as between time management and student performance. The combined effects of SRL and time management on student performance are equal to their distinct indirect effects through motivation lends confidence to this claim. Time management and SRL were not directly linked to student performance in the suggested structural model, suggesting that the effects are entirely mediated through motivation.

Theoretically, these results align with the Self-Determination Theory (Ryan & Deci, 2020). According to the idea, behavioral elements like efficient time management and SRL improve student's sense of competence and autonomy, which in turn promotes autonomous motivation. Higher motivation in turn encourages more involvement, perseverance, and academic achievement. Thus, the results indicate that students' motivation in online learning environments is the main way that improvements in time management and SRL behaviours lead to greater student performance.

Table 6. The results of hypothesis testing for mediation effect

	Direct effect		VAF analysis	Significant / not significant
	Coefficient	P-values		
Time Management on the Mediation Effect of Motivation	0.185	0.000	$\frac{0.164}{0.185} = 88\%$ (full mediation)	Significant
Self-regulated learning on the Mediation Effect of Motivation	0.828	0.000	$\frac{0.734}{0.828} = 88\%$ (full mediation)	Significant
Mediation Effect of Motivation on Student Performance	0.888	0.000		

H_{4a} and H_{4b} are supported by the bootstrapping results, which show that time management and SRL have indirect effects on student performance through motivation (Table 7). The results imply that in the suggested structural model, motivation serves as a mediator.

Table 7. The results of indirect relationship

Hypothesis	Indirect Relationship	β	t-value	p-value	Decision
H_{4a}	TM $\rightarrow$ MT $\rightarrow$ SP	0.164	9.913	0.000	Supported
H_{4b}	SRL $\rightarrow$ MT $\rightarrow$ SP	0.734	38.127	0.000	Supported

Note. SP = Student Performance, MT = Motivation, TM = Time Management, SRL = Self-regulated Learning

As shown in Table 8, the model demonstrates strong explanatory power, with motivation exhibiting an R^2 value of 0.949. This means that approximately 94.9% of the variance in motivation is explained by its predictors, time management and SRL. Similarly, the student performance construct recorded an R^2 of 0.786, indicating that 78.6% of its variance is explained by motivation within the proposed model. According to Henseler et al. (2022), this also reflects strong predictive accuracy, suggesting that the model effectively captures the key determinants of student performance in online learning contexts.

Table 8. Results of r^2

	r^2
MT	0.949
SP	0.786

Note. SP = Student Performance, MT = Motivation

The Q^2 values, obtained through blindfolding procedures in SmartPLS, were used to assess the predictive relevance of the endogenous constructs in the model. As shown in Table 9, the results revealed Q^2 values of 0.584 for motivation and 0.513 for student performance. According to Hair et al. (2022) and Sarstedt et al. (2022), Q^2 values above 0.35 are indicative of high predictive relevance.

These values suggest that both motivation and student performance have substantial predictive accuracy, and that the exogenous variables in the model, time management and SRL, play a significant role in forecasting these outcomes. The high Q^2 scores reinforce the model's robustness, implying that the structural pathways meaningfully contribute to the predictive capability of the constructs beyond mere explanatory power.

Thus, these findings support the model's external predictive validity and demonstrate that it is not only theoretically sound but also practically applicable in predicting motivation and student performance in Malaysian online higher education settings.

Table 9. Results of q^2

	q^2
MT	0.584
SP	0.513

Note. SP = Student Performance, MT = Motivation

The effect size (f^2) was assessed to evaluate the relative impact of each exogenous construct on its corresponding endogenous variable within the structural model. According to Cohen's (1988) guidelines, f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effect sizes, respectively.

As shown in Table 10, the link between motivation and student performance has a very large effect size ($f^2 = 3.675$). This suggests that motivation has a strong influence on student performance in online learning. Such a notable effect highlights the vital role of motivation as an underlying mechanism affecting academic results in digital settings. Similarly, the effect size for the path SRL $\rightarrow$ motivation was also remarkably high ($f^2 = 5.953$), suggesting a strong influence of SRL on student motivation. This shows that university students who engage in SRL behaviours are more likely to develop stronger motivation in online learning environments. On the other hand, the relationship between time management and motivation produced an f^2 value of 0.297, indicating a moderate to large effect. This result confirms that effective time management significantly enhances students' motivation levels, consistent with theoretical expectations from SDT and previous empirical studies.

Overall, the f^2 results demonstrate that the structural model's pathways not only achieve statistical significance but also exhibit meaningful and substantial effect sizes, especially for motivation's role in predicting student performance.

Table 10. Results of f^2

	MT	SRL	SP	TM	
MT			3.675		
SRL	5.953				
SP					
TM	0.297				

Note. SP = Student Performance, MT = Motivation, TM = Time Management, SRL = Self-regulated Learning

Discussion of Findings

This study provides robust empirical support for the proposed conceptual framework, rooted in SDT Theory, by validating the hypothesised relationships among time management, SRL, motivation, and student performance in Malaysian PHEIs online learning environments.

H_1 : Time Management and Motivation

The results support H_1 by showing a strong positive correlation between motivation and time management. This is in line with SDT, which contends that efficient time management boosts students' motivation by increasing their sense of competence and autonomy (Ryan & Deci, 2020). According to earlier research, students who successfully manage their study time are more motivated and involved in online learning (Li et al., 2023; Sun et al., 2023). This implies that motivating undergraduate students at Malaysian PHEIs is mostly dependent on efficient time management.

H_2 : Self-Regulated Learning and Motivation

The results confirm H_2 by showing a strong positive correlation between motivation and SRL. This result is in line with SDT, which contends that SRL strengthens students' autonomous motivation by increasing their competence and autonomy (Ryan & Deci, 2020). Since students who establish objectives, track their progress, and control their learning tactics are more likely to stay motivated, the outcome also supports the literature review that identified SRL as a

critical predictor of motivation in online learning (Li et al., 2023; Zheng & Xiao, 2024). Thus, in Malaysian PHEIs, successful SRL is essential to maintaining students' desire for online learning.

H_3 : Motivation and Student Performance

The results support H_3 by showing that motivation significantly improves student performance. This result is in line with SDT, which holds that by meeting students' demands for autonomy, competence, and relatedness, autonomous motivation fosters increased engagement, perseverance, and academic success (Ryan & Deci, 2020). The outcome corroborates the literature review, which found that motivation is a crucial factor in determining how well students succeed in online courses where they must continue their education on their own. Highly motivated students exhibit higher levels of engagement, perseverance, and academic success in online learning settings, according to recent studies (Li et al., 2023; Zheng & Xiao, 2024). As a result, motivation is essential for improving undergraduate students' performance in Malaysian PHEIs.

H_{4a} and H_{4b} : Motivation as a Mediator

Both hypotheses are supported by the results, which show that motivation strongly mediates the links between time management and student performance (H_{4a}) and between SRL and student performance (H_{4b}). SDT, which suggests that learning behaviors improve academic achievement by first bolstering students' autonomous motivation, is in line with this study (Ryan & Deci, 2020). Effective time management and SRL increase students' sense of competence and autonomy, which boosts motivation and improves academic success, as the research review discusses. According to recent research, motivation plays a significant role in the relationship between academic outcomes in online learning environments and SRL behaviors (Li et al., 2023; Öztürk & Türker, 2024). Additionally, the study's entire mediation indicates that students' motivation is the main way that time management and SRL improve student performance. This demonstrates that the primary psychological factor supporting undergraduate students' academic achievement in Malaysian PHEIs is motivation.

Implications of the Study

The findings of this study carry profound theoretical and practical implications for online education, particularly within the context of PHEIs in Malaysia. By confirming that motivation fully mediates the relationship between time management, SRL, and student performance, this study extends existing frameworks and suggests actionable strategies for improving online learning outcomes.

Theoretical implications

By showing that motivation completely mediates the relationship between time management, SRL, and student performance in online learning, this study expands on SDT. The results boost the explanatory power of SDT in explaining learning outcomes in online environments by indicating that effective learning behaviors only improve academic performance when they increase students' motivation (Ryan & Deci, 2020).

Additionally, by pinpointing motivation as the fundamental mechanism which time management and SRL impact student performance, this study adds to the body of knowledge on SRL. The results corroborate recent studies that provide a more thorough explanation of student performance in online learning by combining behavioral, metacognitive, and

motivational perspectives into a unified framework (Li et al., 2023; Jansen et al., 2024). This offers more empirical support for the use of SDT in Malaysian PHEIs.

Practical implications

The results show that motivation is the primary mechanism which time management and SRL enhance student performance, which has significant practical implications for educators. As a result, teachers should use autonomy-supportive teaching strategies to encourage students' motivation in addition to honing their learning abilities. In online learning settings, goal-setting activities, reflective learning exercises, prompt feedback, and self-monitoring opportunities can boost students' motivation and motivate them to use efficient learning strategies (Ryan & Deci, 2020; Li et al., 2023).

Universities can bolster student assistance programs at the institutional level by offering training courses and workshops that foster time management, SRL, and motivational abilities. Additionally, orientation programs and online learning support services might better equip students to handle independent study and maintain enthusiasm throughout their academic careers. In online learning environments, such activities are likely to enhance students' academic performance and engagement (Jansen et al., 2024; Zheng & Xiao, 2024).

The results indicate that, from a policy standpoint, digital learning initiatives should focus on developing students' SRL and motivating competences in addition to enhancing technology infrastructure. To further support academic performance, universities and higher education policymakers should integrate these competencies into online learning policies and student development initiatives. These initiatives could increase students' preparedness for distance learning and help Malaysian PHEIs achieve better academic results.

Limitations and future research

Despite the valuable insights generated by this study, several limitations must be acknowledged to contextualise its findings and guide future inquiry.

First, the study's sample was restricted to undergraduate students from PHEIs in Malaysia, which limits the generalisability of the findings. Educational structures, pedagogical practices, and resource availability may differ significantly across public institutions and other national or regional contexts, particularly within the Global South, where systemic inequalities persist (Abdullah et al., 2023). Consequently, caution is warranted in applying these findings to broader or different populations.

Second, the study employed a cross-sectional design, which precludes the establishment of causality. Although significant relationships were observed between time management, SRL, motivation, and student performance, the directionality of these associations remains uncertain. Future studies should adopt longitudinal or experimental designs to better capture the temporal dynamics and causal pathways among these constructs (Lim & Tan, 2024).

Third, the study relied solely on self-reported measures, which raises concerns about common method bias and social desirability effects. While self-reporting is practical and widely used, it may not fully reflect actual learning behaviours. Future research would benefit from incorporating objective behavioural metrics, such as Learning Management System (LMS) login frequency, time-on-task data, or assignment submission timestamps, to triangulate and validate self-reported findings (Jansen et al., 2024).

To address these limitations and expand the theoretical scope, several directions for future research are recommended. Digital literacy should be explored as a moderating variable, especially in populations facing digital inequities, such as limited internet access or low technological fluency. Understanding how digital literacy interacts with SRL and motivation can inform more inclusive online learning designs (Kim & Lee, 2023). Comparative studies across public and private higher education institutions, as well as cross-national comparisons, are needed to investigate how institutional culture, funding structures, and policy frameworks shape motivational dynamics and learning outcomes in online education (Barón et al., 2023). The development and evaluation of culturally responsive SRL interventions, co-designed with local learners in ASEAN or similar educational contexts, can ensure that learning strategies align with regional values, language preferences, and cognitive styles (Wong et al., 2024). With the growing use of AI-based learning tools, future research must also consider the ethical implications of using algorithmic systems to influence motivation and behaviour. Topics such as algorithmic anxiety, student autonomy, and the psychological effects of nudging systems warrant critical exploration (Chen et al., 2024).

By addressing these areas, future research can deepen our understanding of how motivational mechanisms operate across diverse learning environments and help shape equitable, effective, and ethically sound digital education practices.

Conclusion

Grounded in SDT, this study explored the mediating role of motivation in the relationship between time management, SRL, and student performance in Malaysian PHEIs online learning environments. The findings revealed that although time management and SRL significantly influence student performance, their effects on student performance are fully mediated by motivation. This highlights motivation as the psychological engine that transforms behavioural strategies into meaningful academic achievements.

The study makes an important theoretical contribution by advancing SDT in the context of online learning. It demonstrates that competence, autonomy, and self-direction, the core psychological needs outlined in SDT, serve as critical mechanisms through which learning behaviours such as time management and SRL translate into improved academic performance. Furthermore, this research enhances existing models of time management and SRL by positioning motivation as a central and necessary conduit rather than a parallel factor.

From a practical perspective, the results suggest that enhancing time management or SRL skills alone is insufficient unless accompanied by strategies that actively cultivate intrinsic motivation. Educators, instructional designers, and institutional leaders should prioritise the design of learner-centred, motivation-driven online learning environments. These might include feedback systems that promote mastery, flexible assessment options that foster autonomy, and digital tools that scaffold motivational engagement. Such efforts are especially vital in supporting diverse and underserved student populations, who may face additional barriers in online education.

In conclusion, this study affirms that motivated engagement, not merely task discipline or structural organisation, is the true driver of success in online learning contexts. As digital education continues to expand globally, especially in the post-pandemic landscape, the next frontier of pedagogical innovation must focus on nurturing students' intrinsic motivation as the foundation for sustainable and equitable academic achievement.

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References

- Abdullah, N. A., Rahman, S. A., & Yusoff, M. S. (2023). The role of motivation in online learning: A study of Malaysian undergraduate students. *Journal of Educational Psychology*, 45(2), 210-225.
- Abdullah, N., Lee, C. Y., & Rahman, H. (2023). Motivational feedback and learner autonomy in Malaysian online education. *Malaysian Journal of Learning and Instruction*, 20(2), 55–70.
- Ahmad, M., Sharif, S., & Majid, S. (2022). The role of motivation in academic performance: A mediating model. *Educational Psychology*, 42(7), 875–890.
- Ahmad, N., Khairi, N. H. M., Hassanuddin, N. A., Mama, S. S., & Rosly, N. S. (2023). Student's perceptions of the effectiveness on time management skills in assisting their online distance learning. *Jurnal Intelek*, 18(2), 227-232.
- Al Mamun, A., Rahman, M. K., & Salleh, M. R. (2023). Factors influencing students' online learning performance in higher education institutions: Evidence from Malaysia. *Education and Information Technologies*, 28(9), 11245–11267.
- Alberts, L., Lyngs, U., & Lukoff, K. (2024). Designing for sustained motivation: A review of self-determination theory in behaviour change technologies. *arXiv*.
- Alyami, A., Abdulwahed, A., Azhar, A., Binsaddik, A., & Bafaraj, S. M. (2021). Impact of time management on students' academic performance: A cross-sectional study. *Creative Education*, 12(3), 471–485.
- Awang, Z. (2024). Structural equation modeling using AMOS: A step-by-step approach (5th ed.). *UiTM Press*.
- Barón, J. D., Bend, M., Mirza, F., Afzal, N., Wolde, H., & Hussian, N. (2023). World Bank Education Global Practice task team under the Data and Research in Education (DARE) trust fund, facilitated by the Foreign, Commonwealth, and Development Office (FCDO).
- Becker, J. M., Cheah, J. H., Gholamzade, R., Ringle, C. M., & Sarstedt, M. (2023). PLS-SEM's most wanted guidance. *International Journal of Contemporary Hospitality Management*, 35(1), 321-346.
- Beluce, A. C., & Oliveira, K. L. D. (2015). Students' motivation for learning in virtual learning environments. *Paidéia (Ribeirão Preto)*, 25, 105-113.
- Chen, Y., Tan, R., & Lim, K. (2024). Algorithmic anxiety and student autonomy: Ethical implications of AI in education. *AI & Society*, 39(2), 401–417.
- Cullum, A. W. (2016). Student motivation and intent to take online courses.
- Deci, E. L., & Ryan, R. M. (2012). Self-determination theory. *Handbook of theories of social psychology*, 1(20), 416-436.
- Deci, E. L., & Ryan, R. M. (2013). Intrinsic motivation and self-determination in human behavior. *Springer Science & Business Media*.
- Deci, E. L., & Ryan, R. M. (2022). Self-determination theory: Basic psychological needs in motivation, development, and wellness. *Guilford Press*.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Fowler, S. (2007). The motivation to learn online questionnaire (Doctoral dissertation, University of Georgia).
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). *Sage Publications*.

- Hashim, H. A., Ismail, N. H., & Ahmad, F. (2023). Time management and its impact on student performance in online learning: Evidence from Malaysian private universities. *Journal of Educational Technology and Society*, 26(1), 78-92.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135.
- Henseler, J., Schubert, F., & Dijkstra, T.K. (2022). Confirmatory composite analysis. *European Journal of Marketing*.
- Jansen, M., Meier, A., & Rienties, B. (2024). Motivational mechanisms in digital education: A cross-cultural study. *Computers & Education*, 206, 104614.
- Junaštíková, J. (2024). Self-regulation of learning in the context of modern technology: A review of empirical studies. *Interactive Technology and Smart Education*, 21(2), 270-291.
- Karunanidhi, S., & Chitra, T. (2021). Mediating effect of academic motivation on time management and academic achievement among university students. *International Journal of Education and Development*, 41(2), 221–234.
- Kasantra, T., Ho, S. C., Tan, L. K., Tan, S. Y., & Tan, W. M. (2013). Analysis of factors influencing the academic performance of undergraduates in Kampar (Doctoral dissertation, UTAR).
- Kim, H. J., & Lee, J. (2023). Exploring the mediating effect of motivation on the relationship between self-regulated learning and academic achievement in higher education. *Asia Pacific Education Review*, 24(1), 67–82.
- Kim, Y., & Lim, S. (2024). Time management, academic motivation, and performance: A moderated mediation analysis among university students. *Journal of College Student Development*, 65(1), 15–30.
- Kleimola, R., Hirsto, L., & Ruokamo, H. (2025). Promoting higher education students' self-regulated learning through learning analytics: A qualitative study. *Education and Information Technologies*, 30(4), 4959-4986.
- Kline, R. B. (2023). Principles and practice of structural equation modeling (5th ed.). Guilford Press.
- Kocak, S., & Bayram, N. (2022). Intrinsic motivation as a mediator in the relationship between self-regulated learning and academic performance. *Educational Studies*, 48(5), 619–634.
- Lee, Y. J., & Huang, H. M. (2022). Self-regulated learning and student performance: The mediating role of motivation in online education. *The Internet and Higher Education*, 52, 100832.
- Li, Y., Peng, W., Yang, H., & Sun, Y. (2023). Do learners share the same perceived learning outcomes in MOOCs? The role of motivation and self-regulated learning strategies. *The Internet and Higher Education*, 56, 100880.
- Lim, K. S., & Tan, J. Y. (2024). Causal pathways in self-regulated learning: A longitudinal analysis of online university students. *Asia Pacific Journal of Education*, 44(1), 56–72.
- Lim, Y. M., Tan, K. L., & Ng, T. F. (2022). Procrastination and time management challenges in online learning: Perspectives from Malaysian undergraduates. *Asian Journal of University Education*, 18(3), 145-160.
- Nallaluthan, K., Kamaruddin, S., Thurasamy, R., Ghouri, A., & Kanapathy, K. (2024). Quantitative data analysis using pls-sem (smartpls): Issues and challenges in ethical consideration. *International Business Education Journal*, 17(2), 41-54.
- Nesamalar, J., Ling, T. P., & Singaram, N. (2022). Time management behaviour during the COVID-19 pandemic: A focus on higher education students. *Asia Pacific Journal of Futures in Education and Society*, 1(1), 17-38.

- Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational psychology review*, 16, 385-407.
- Qin, X. (2024). An introduction to causal mediation analysis. *Asia Pacific Education Review*, 25, 703–717.
- Rashid, S. F., Tan, K. H., & Lim, Y. M. (2023). Student engagement in online learning environments: A case study of Malaysian undergraduates. *Journal of Higher Education Policy and Management*, 45(3), 301-315.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25(1), 54-67.
- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, 101860.
- Sarstedt, M., Hair, J. F., Pick, M., Liengaard, B. D., Radomir, L., & Ringle, C. M. (2022). Progress in partial least squares structural equation modeling use in marketing research in the last decade. *Psychology & Marketing*, 39(5), 1035-1064.
- Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of market research* (pp. 587-632). Cham: *Springer International Publishing*.
- Schunk, D. H., Pintrich, P. R., & Meece, J. L. (2014). Motivation in education: Theory, research, and applications.
- Sun, J. C.-Y., Liu, Y., Lin, X., & Hu, X. (2023). Temporal learning analytics to explore traces of self-regulated learning behaviors and their associations with learning performance, cognitive load, and student engagement in an asynchronous online course. *Frontiers in Psychology*, 13, 1096337.
- Tan, C. L., & Lee, K. W. (2023). Motivation as a mediator between SRL and academic success. *Journal of Educational Research and Innovation*, 12(4), 67-82.
- Teo, S. C., Lilian, A., & Koo, A. C. (2023). Examining the effects of academic motivation and online learning on Malaysian tertiary students' psychological well-being and perceived learning performance. *Cogent Education*, 10(1), 2186025.
- Trueman, M., & Hartley, J. (1996). A comparison between the time-management skills and academic performance of mature and traditional-entry university students. *Higher education*, 32(2), 199-215.
- Wang, C. H., Shannon, D. M., & Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, 34(3), 302-323.
- Wang, J., Liu, X., & Zhao, L. (2023). Time management and academic performance: The mediating role of self-regulated learning and academic stress. *Educational Psychology*, 43(3), 331–346.
- Wong, C. J., Lim, K. S., & Noor, S. A. (2024). Bridging SRL and performance through motivational scaffolds in Southeast Asian digital classrooms. *International Journal of Educational Research*, 125, 102098.
- Yusuf, A. R., Ahmad, S., & Zainal, N. F. (2023). Institutional support and its impact on student performance in online learning: Evidence from Malaysian private higher education institutions. *Journal of Educational Research and Innovation*, 12(4), 67-82.
- Zeng, Y., Zhang, W., Wei, J., & Zhang, W. (2023). The association between online class-related enjoyment and academic achievement of college students. *BMC Psychology*, 11, 349.
- Zheng, Y., & Xiao, A. (2024). A structural equation model of online learning: Investigating self-efficacy, informal digital learning, self-regulated learning, and course satisfaction. *Frontiers in Psychology*, 14, 1276266.

- Zhou, Z., & Zhang, Y. (2024). Intrinsic and extrinsic motivation in distance education: A self-determination perspective. *American Journal of Distance Education*, 38(1), 51–64.
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, 41(2), 64–70.

Appendix A

Construct	Code	Measurement item	Sources
Student performance	SP1	My CGPA is better when online learning was introduced.	Kasantra et al. (2013) and Realyvásquez-Vargas et al. (2020).
	SP2	I am satisfied with my performance when there was online learning.	
	SP3	My online study performance is better than my physical study at university.	
	SP4	I can perform academically in online courses as well.	
	SP5	When having online courses, I have the ability to gain more knowledge.	
Motivation	MT1	I'm motivated to master my study skills that being taught using online learning.	Wang et al. (2013), Beluce & Oliveira (2015), Cullum (2016), Fowler (2007).
	MT2	I want to get better grades than most of the other students in my classes.	
	MT3	Getting a good grade via online learning is the most satisfying thing for me.	
	MT4	The most satisfying thing for me is trying to understand the content as thoroughly as possible when using online learning.	
	MT5	When using online learning, I prefer materials that really trigger me to learn new things.	
Time management	TM1	I have a set of goals for the entire course duration.	Wang et al. (2013) and Alyami et al. (2021).
	TM2	I frequently review my notes for understanding.	
	TM3	I spend my time wisely to avoid distractions.	
	TM4	I keep to a schedule so that I can achieve my objectives on time.	
	TM5	I make sure that I keep up with the weekly readings and the assignments given.	
Self-regulated learning	SRL1	I try to think through a topic and decide what I am supposed to learn.	Wang et al. (2013).
	SRL2	I ask myself questions to make sure I understand the material that I have been studying.	
	SRL3	I usually study in a place where I can concentrate.	
	SRL4	I make up questions to help focus in my study.	
	SRL5	I summarise the main ideas from the course for discussions.	