

Strengthening Confidence, Reducing Deferral: A Relational Model of Self-Regulated Learning, Self-Efficacy, and Academic Procrastination

Memperkuat Keyakinan, Mengurangi Penundaan: Model Relasional antara Self-Regulated Learning, Self-Efficacy, dan Prokrastinasi Akademik

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Abstract

The phenomenon of academic procrastination among senior undergraduates is a significant issue in the context of higher education because it can hinder the completion of academic assignments and reduce the quality of learning outcomes. This condition is often linked to psychological factors related to self-management skills in learning and individuals' beliefs regarding their academic abilities. This study aims to test the relational model between self-regulated learning, self-efficacy, and academic procrastination. This study employed a quantitative approach with an explanatory design involving 372 senior undergraduate students in Indonesia selected via purposive sampling. Data analysis was conducted using Partial Least Squares-based Structural Equation Modeling (SEM-PLS). The results indicate that self-regulated learning has a positive effect on self-efficacy ($\beta = 0.880$) and a negative effect on academic procrastination ($\beta = -0.492$). Additionally, self-efficacy has a negative effect on academic procrastination ($\beta = -0.440$) and was found to partially mediate the relationship between self-regulated learning and academic procrastination (indirect effect = -0.387). Overall, these findings indicate that improving self-regulation skills in learning can strengthen students' academic confidence, which ultimately contributes to a reduction in procrastination behavior.

Keywords : *Academic Procrastination, Self-Efficacy, Self-Regulated Learning*

Abstrak

Fenomena prokrastinasi akademik pada mahasiswa tingkat akhir menjadi isu penting dalam konteks pendidikan tinggi karena dapat menghambat penyelesaian tugas akademik dan menurunkan kualitas pencapaian belajar. Kondisi ini sering dikaitkan dengan faktor psikologis yang berkaitan dengan kemampuan pengelolaan diri dalam belajar serta keyakinan individu terhadap kemampuan akademiknya. Penelitian ini bertujuan untuk menguji model relasional antara self-regulated learning, self-efficacy, dan prokrastinasi akademik. Penelitian ini menggunakan pendekatan kuantitatif dengan desain eksplanatori terhadap 372 mahasiswa tingkat akhir di Indonesia yang dipilih melalui teknik purposive sampling. Analisis data dilakukan menggunakan Structural Equation Modeling berbasis Partial Least Squares (SEM-PLS). Hasil penelitian menunjukkan bahwa self-regulated learning berpengaruh positif terhadap self-efficacy ($\beta = 0,880$), serta berpengaruh negatif terhadap prokrastinasi akademik ($\beta = -0,492$). Selain itu, self-efficacy berpengaruh negatif terhadap prokrastinasi akademik ($\beta = -0,440$) dan terbukti memediasi secara parsial hubungan antara self-regulated learning dan prokrastinasi akademik (indirect effect = $-0,387$). Secara keseluruhan, temuan ini menunjukkan bahwa peningkatan kemampuan regulasi diri dalam belajar mampu memperkuat keyakinan akademik mahasiswa, yang pada akhirnya berkontribusi pada penurunan perilaku prokrastinasi.

Kata Kunci : *Prokrastinasi Academic, Self-Efficacy, Self-Regulated Learning*

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INTRODUCTION

In higher education, students face various academic demands that require independence, responsibility, and the ability to manage their own learning process (Kurniawan, 2024). At the college level, the learning system is no longer instructor-centered but student-centered, requiring students to be able to plan, manage, and evaluate their own learning process. However, in practice, not all students are able to adapt to these demands optimally (Wolters et al., 2017). The majority of students struggle with time management, setting priorities, and maintaining motivation to study, especially when faced with complex and long-term academic assignments (David et al., 2024; Mahmud & German, 2021).

A common phenomenon resulting from students' inability to manage their learning process is procrastination (Steel, 2007). Procrastination is the behavior of intentionally delaying the completion of academic tasks even though the individual knows that such delays can lead to negative consequences (Blake, 2019). This phenomenon has become a serious problem in higher education because it can lead to delays in completing studies, poor academic performance, and increased psychological stress among students (Ahmed et al., 2023; Gareau et al., 2019).

Among senior students, academic procrastination tends to be higher than among students in their early years. Various studies show that approximately 70% to 95% of students—especially seniors experience procrastination (Fentaw et al., 2022). This is due to the complexity of the final project or thesis, which requires strong critical thinking skills, time management, and a high degree of independent learning. In addition, the final project is a long-term assignment without clear daily deadlines, so students must be able to set their own goals and work schedules independently (Zaiha, 2025). This situation often causes students to feel overwhelmed, lose motivation, and ultimately put off working on their final projects (Fatmala & Nastiti, 2025).

In terms of educational psychology, procrastination is not only caused by external factors such as the workload or the learning environment, but is also influenced by internal factors, one of which is self-efficacy (Rad et al., 2025). According to Baron & Byrne (2004), Self-efficacy is an individual's belief in their ability to complete tasks or achieve specific goals. In an academic context, self-efficacy refers to a student's belief that they are capable of understanding the material, completing assignments, and successfully completing their studies. Students with high self-efficacy tend to be more confident, more persistent, and better able to cope with academic challenges (Bandura, 1997; Dewi et al., 2023).

Conversely, students with low self-efficacy tend to doubt their abilities, feel unable to complete difficult tasks, and are more likely to give up when faced with setbacks (Klassen et al., 2008). This lack of self-confidence often leads students to avoid academic assignments, which then manifests as procrastination (Ashraf et al., 2023; Rad et al., 2025). In addition, academic procrastination can serve as an

avoidance strategy employed by students when they lack confidence in their ability to complete assignments.

However, self-efficacy does not appear suddenly; rather, it develops through the learning experiences an individual goes through (Bandura, 1997; Usher & Pajares, 2008). One of the key factors in shaping self-efficacy is self-regulated learning (B. J. Zimmerman & Schunk, 2011; M. A. Zimmerman, 2000). Self-regulated learning is an individual's ability to actively manage their learning process through planning, monitoring, controlling, and evaluating that process (Pintrich, 2004; B. J. Zimmerman, 2002). Students who demonstrate strong self-regulated learning tend to have more effective learning strategies, better time management, and the ability to manage their motivation and emotions during the learning process (Wolters, 2011; B. J. Zimmerman, 2008).

Academic procrastination cannot be understood as a standalone behavior; rather, it is the result of the interaction of various psychological factors within a student's learning system (Steel, 2007; Tuckman, 1991). Self-efficacy serves as a motivational factor that influences how students view academic assignments (Bandura, 1997; Schunk, 1995). In contrast, self-regulated learning serves as a strategic factor that influences how students manage their learning process (Pintrich, 2004; M. A. Zimmerman, 2000). It is this interaction between beliefs and learning strategies that ultimately influences whether or not academic procrastination occurs (Klassen et al., 2008; Wolters, 2003).

Students who demonstrate strong self-regulated learning tend to be able to set clear learning goals, create study plans, monitor their progress, and evaluate the learning outcomes they have achieved (Zimmerman, 2002; Zimmerman & Schunk, 2011). When students successfully achieve their planned learning goals, they experience a sense of mastery that can enhance their self-efficacy (Bandura, 1997; Usher & Pajares, 2008). Therefore, self-regulated learning can strengthen self-efficacy through the experiences of academic success that students have (Schunk, 2003; Zimmerman, 2000).

High self-efficacy, in turn, influences how students view academic tasks (Bandura, 1997; Zimmerman, 2002). Students with high self-efficacy tend to view difficult tasks as challenges to be overcome, rather than as threats to be avoided (Schunk, 1995; Zimmerman, 2000). Conversely, students with low self-efficacy tend to view tasks as a burden, leading them to prefer procrastinating on those tasks (Klassen et al., 2008; Steel, 2007). This indicates that self-efficacy plays a crucial role in determining whether students will procrastinate or not (Steel, 2007; Wäschle et al., 2014).

In the relational model between self-regulated learning, self-efficacy, and academic procrastination, self-regulated learning not only serves as a direct predictor of academic procrastination but also plays an indirect role through self-efficacy (Hwang & Oh, 2021; Wolters, 2003). This means that self-regulation skills in learning can enhance students' self-efficacy, and this increase in self-efficacy

subsequently contributes to a reduction in academic procrastination (Wäschle et al., 2014; Zimmerman, 2000). This model demonstrates the mediating role of self-efficacy in the relationship between self-regulated learning and academic procrastination (Hwang & Oh, 2021; Klassen et al., 2008).

In an endeavour to minimize the impact of procrastination, it is not enough to simply boost motivation or provide time-management training, as procrastination results from the interaction of various psychological systems (Pintrich, 2004; Zimmerman, 2008). Interventions must be designed to enhance students' self-regulation skills in learning while simultaneously strengthening their self-efficacy (Wolters, 2011; Zimmerman & Schunk, 2011). In other words, addressing academic procrastination must be approached systematically, taking into account the interaction between students' cognitive, motivational, and learning behavioral factors (Pintrich, 2004; Zimmerman, 2000).

Earlier research has shown that self-regulated learning is negatively associated with academic procrastination, and that self-efficacy is also negatively associated with academic procrastination (Klassen et al., 2008; Steel, 2007; Wäschle et al., 2014). However, few studies have examined the relationship among these three variables within a comprehensive relational model, particularly among senior students (Hwang & Oh, 2021). In fact, senior students are the group most vulnerable to academic procrastination due to more complex academic demands and the pressure to complete their studies promptly (Sirois, 2014; Steel, 2007).

Therefore, it is important to examine the relational model between self-regulated learning, self-efficacy, and academic procrastination within a comprehensive theoretical framework (Zimmerman & Schunk, 2011; Zimmerman, 2000). This model is expected to explain the psychological mechanisms that lead to academic procrastination, as well as the role of self-regulated learning in strengthening students' self-efficacy, which can ultimately reduce academic procrastination (Wäschle et al., 2014; Wolters, 2003).

This study is significant because it not only examines the direct relationships among variables but also investigates indirect relationships through mediating mechanisms (Hayes, 2013; Hwang & Oh, 2021). By using a relational model, this study is expected to provide a more comprehensive understanding of the factors influencing academic procrastination among senior students (Klassen et al., 2008; Steel, 2007).

The results of this study are expected to make a theoretical contribution to the development of educational psychology research, particularly regarding self-regulated learning, self-efficacy, and academic procrastination, as well as to provide practical insights for higher education institutions in designing programs to enhance students' self-regulation skills and self-efficacy, thereby reducing academic procrastination and helping students complete their studies on time (Wäschle et al., 2014; B. J. Zimmerman & Schunk, 2011).

RESEARCH METHODS

This research employs a quantitative approach with an explanatory design aimed at testing the causal relationships among variables in a relational model involving self-regulated learning, self-efficacy, and academic procrastination. The focus of this study is on students' learning behaviors, specifically those related to self-regulation in learning, academic self-efficacy, and tendencies toward academic procrastination. The study focuses on senior students who are completing their theses or final projects, as at this stage students face more complex academic demands, a high degree of independence in learning, and are prone to academic procrastination.

The respondents in this study were 372 senior undergraduate students from several universities in Indonesia who were writing their theses or final projects. Respondents were selected using purposive sampling, a technique in which the sample is determined based on specific criteria aligned with the research objectives. The criteria for respondents in this study included being active students in their final semester, currently writing a thesis or final project, and having previously exhibited a tendency to procrastinate on academic assignments.

The research instrument consists of three main scales that measure self-regulated learning, self-efficacy, and academic procrastination. These instruments were adapted using the procedure outlined by Beaton et al. (2000), which consists of five stages: translations, synthesis, back translations, expert committee review, and pretesting. The self-regulated learning scale, adapted from an instrument developed by M. A. Zimmerman (2000), consists of 15 items with factor loadings (λ) ranging from 0.509 to 0.958; the self-efficacy scale, adapted from an instrument by Schwarzer & Jerusalem (1995), consists of 8 items with factor loadings (λ) ranging from 0.573 to 0.956, and academic procrastination was measured using a scale developed by Steel (2010) consisting of 12 items with factor loadings (λ) ranging from 0.836 to 0.940.

The statistical analysis in this study used Partial Least Squares-based Structural Equation Modeling (SEM-PLS) with the assistance of SmartPLS software. The analysis was conducted in two stages: evaluation of the measurement model (outer model) and evaluation of the structural model (inner model). The outer model evaluation was conducted to test the validity and reliability of the instruments through tests of convergent validity, discriminant validity, composite reliability, and Cronbach's alpha. Subsequently, the inner model evaluation was conducted to test the relationships among variables by examining the values of collinearity, R-squared, path coefficients, effect sizes, and predictive relevance. Hypothesis testing and mediation analysis were conducted using the bootstrapping technique to assess the significance of direct and indirect effects among the variables. Through SEM-PLS analysis, this study aims to examine the role of self-efficacy as a mediating variable in the relationship between self-regulated learning and academic procrastination among senior undergraduate students.

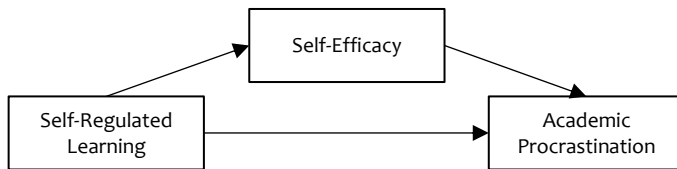


Figure 1 Research Model

RESEARCH RESULTS

Subject Description

The participants in this study came from several universities in Indonesia. The following is a description of the participants based on their university of origin.

Table 1 Description of the University's Origins

University	Total	Percentage
Universitas Negeri Gorontalo	167	44.8%
IAIN Sultan Amai Gorontalo	29	7.79%
Universitas Muhammadiyah Gorontalo	167	44.8%
Universitas Nahdatul Ulama Gorontalo	9	2.4%
Total	372	100%

Based on the description above, the research subjects were predominantly students from Gorontalo State University and Muhammadiyah University of Gorontalo.

Table 2 Description of the Subject's Gender

Gender	Total	Percentage
Male	118	31.7%
Female	254	68.3%
Total	372	100%

Based on this data, it can be seen that the majority of the research subjects are female.

Table 3 Description of Data

Variable	Hypothetical Data				Empirical Data			
	Max	min	Mean	SD	Max	min	Mean	SD
SRL	75	15	82.5	72.5	68	32	50.01	62.6
SE	40	8	44	38.6	39	29	34.2	34.1
AP	60	12	66	58	49	19	28.9	45.8

Description:

Max : Maximum total score

Min : Minimum total score

Mean : Average

SD : Standard deviation

After conducting descriptive data analysis, the researcher categorized the research subjects based on the scores obtained into low, medium, and high according to (Azwar, 2012; Cohen et al., 2007) as follows:

Table 4 Categorization Formula

Categorization	Formula
Low	$X < (\text{Mean} - \text{SD})$
Medium	$(\text{Mean} - \text{SD}) \leq X \leq (\text{Mean} + \text{SD})$
High	$X > (\text{Mean} + \text{SD})$

Description:

X : Raw Score

Mean : Mean Hypothetical

SD : Standard Deviation Hypothetical

Based on the categorization formula, the categorization of each variable can be described as follows:

Table 5 Description of SRL Categories Subject

Score	Categorization	Frequency	Percentage
$X < 10$	Low	6	1.6%
$10.5 \leq X \leq 154.5$	Medium	105	28.2%
$X > 155$	High	261	70.2%
Total		372	100%

Based on the table describing the data analysis results, the majority of subjects were in the high category, totaling 261 (70.2%).

Table 6 Description of SE Categories Subject

Score	Categorization	Frequency	Percentage
$X < 5.4$	Low	8	2.2%
$6 \leq X \leq 82.6$	Medium	95	25.5%
$X > 83$	High	269	72.3%
Total		372	100%

Based on the table describing the data analysis results, the majority of subjects were in the high category, totaling 269 (72.3%).

Table 7 Description of AP Categories Subject

Score	Categorization	Frequency	Percentage
$X < 8$	Low	242	65.1%
$8.5 \leq X \leq 123.5$	Medium	145	38.9%
$X > 124$	High	15	4%
Total		372	100%

Based on the table describing the data analysis results, the majority of subjects were in the low category, totaling 242 (65.1%).

Measurement Model

According to Leguina (2015), model evaluation is conducted to assess and evaluate the reliability and validity of measurement instruments. Reliability indicators include the factor loadings and composite reliability (CR) of the scales. According to current standards, item factor loadings must exceed 0.708 (Leguina, 2015). However, if the average variance extracted (AVE) and composite reliability (CR) exceed the threshold, those items may be retained even if their factor loadings fall between 0.4 and 0.7. Therefore, variables with loadings below 0.708 were excluded (Q21), so that only qualifying variables were retained (see Table 1).

Table 3 Reliability and Validity

Constructs	Item	Outer Loadings	Cronbach's α	CR	AVE
Self-Regulated Learning	Q1	0.798	0.967	0.970	0.687
	Q2	0.873			
	Q3	0.759			
	Q4	0.908			
	Q5	0.768			
	Q6	0.826			

Constructs	Item	Outer Loadings	Cronbach's α	CR	AVE
Self-Efficacy	Q7	0.803	0.918	0.934	0.640
	Q8	0.908			
	Q9	0.837			
	Q10	0.861			
	Q11	0.873			
	Q12	0.845			
	Q13	0.902			
	Q14	0.724			
	Q15	0.712			
	Q16	0.848			
	Q17	0.724			
	Q18	0.877			
	Q19	0.867			
	Q20	0.806			
	Q22	0.764			
	Q23	0.842			
Academic Procrastination	Q24	0.903	0.980	0.982	0.820
	Q25	0.918			
	Q26	0.852			
	Q27	0.886			
	Q28	0.888			
	Q29	0.926			
	Q30	0.924			
	Q31	0.919			
	Q32	0.939			
	Q33	0.836			
	Q34	0.940			
	Q35	0.929			

The validity was then assessed through convergent and discriminant validity. Convergent validity was evaluated using the AVE, which must be greater than 0.5. Discriminant validity was evaluated using the heterotrait-monotrait ratio (HTMT) and the Fornell-Larcker criteria. All HTMT values (see Table 2) were below the critical threshold of 0.85, and the correlation coefficients between constructs were smaller than the square root of the AVE (see Table 3), thus meeting the Fornell-Larcker criteria. Therefore, both the HTMT and Fornell-Larcker methods indicate that all constructs possess high discriminant validity.

Table 4 Discriminant validity (HTMT Criterion)

	Academic Procrastination	Self-Efficacy	Self-Regulated Learning
Academic Procrastination			
Self-Efficacy	0.814		
Self-Regulated Learning	0.801	0.819	

Table 5 Discriminant validity (Fornell-Larcker Criterion)

	Academic Procrastination	Self-Efficacy	Self-Regulated Learning
Academic Procrastination	0.806		
Self-Efficacy	0.874	0.800	
Self-Regulated Learning	0.880	0.780	0.829

The results in Tables 2 and 3 show that discriminant validity is met ($HTMT < 0.850$) (Fornell & Larcker, 1981; Henseler et al., 2015).

Structural Model

Inner model evaluation is crucial in research to ensure that the model used is truly valid, accurate, and capable of predicting data.

Table 6 Collinearity test

	Academic Procrastination	Self-Efficacy	Self-Regulated Learning
Academic Procrastination			
Self-Efficacy	2.440		
Self-Regulated Learning	2.440	1.000	

The results show that the Variance Inflation Factor (VIF) < 3 , so it can be concluded that the relationships among the predictors are at an acceptable level and do not cause significant distortion (Hair et al., 2019).

Table 7 Explanatory and predictive relevance

	R ²	Q ²	Model fit
Academic Procrastination	0.818	0.764	SRMR: 0.061
Self-Efficacy	0.775	0.756	NFI: 0.907

The results show that each is classified as having a substantial level of model fit ($R^2 > 0.75$) and possesses predictive significance, with a high level of model prediction accuracy ($Q^2 > 0.50$).

Table 8 Effect size

	Academic Procrastination	Self-Efficacy	Self-Regulated Learning
Academic Procrastination			
Self-Efficacy	-0.239		
Self-Regulated Learning	-0.299	0.440	

Based on the effect size values, self-efficacy has a weak negative relationship with academic procrastination ($ES = -0.239$), self-regulated learning also has a weak negative relationship with academic procrastination ($ES = -0.299$), while self-efficacy has a moderate positive relationship with self-regulated learning ($ES = 0.440$). These findings indicate that the higher a student's levels of self-efficacy and self-regulated learning, the lower their tendency toward academic procrastination; meanwhile, an increase in self-efficacy is also accompanied by an increase in self-regulated learning, although the strength of the relationships between the variables falls within the weak-to-moderate range.

Table 9 Path Coefficient

	Academic Procrastination	Self-Efficacy	Self-Regulated Learning
Academic Procrastination			
Self-Efficacy	-0.440		
Self-Regulated Learning	-0.492	0.880	

Based on table 9, the results of the path coefficient analysis show that self-efficacy has a negative effect on

academic procrastination with a coefficient of $\beta = -0.440$, indicating that the higher students' level of self-efficacy, the lower their tendency to engage in academic procrastination. In addition, self-regulated learning also showed a negative effect on academic procrastination with a coefficient of $\beta = -0.492$, suggesting that an increase in students' ability to regulate their learning process contributes to a reduction in academic procrastination. On the other hand, the relationship between self-efficacy and self-regulated learning has a strong positive coefficient of $\beta = 0.880$, indicating that students with high levels of self-efficacy tend to have better self-regulated learning abilities.

Table 10 Mediating analysis

Relationship	Indirect Effect	2.5%	97.5%	t	p	Direct Effect	t	P
SRL → SE → AP	-0.387	0.123	0.698	2.677	0.007	-0.492	3.051	0.002

Based on Table 10, self-regulated learning significantly mediates the relationship between self-efficacy and academic procrastination, as indicated by an indirect effect of $\beta = -0.387$ ($t = 2.677$; $p = 0.007$; 95% CI = 0.123–0.698). In addition, the direct effect of SRL on academic procrastination was also significant, with a coefficient of $\beta = -0.492$ ($t = 3.051$; $p = 0.002$), indicating that an increase in self-regulated learning plays a role in strengthening the effect of self-efficacy on reducing academic procrastination

DISCUSSION

The results of this study provide a more comprehensive understanding of the dynamics of academic procrastination by situating it within an interconnected psychological system involving self-regulated learning, self-efficacy, and the act of procrastination itself. Academic procrastination is no longer viewed as a single, isolated behavior, but rather as the result of a complex interaction between self-regulation abilities and an individual's belief in their own competence (Bandura, 1997; Steel, 2007; Zimmerman, 2000).

The research findings indicate that self-regulated learning plays a fundamental role in shaping students' academic behavior. This ability enables individuals to organize the learning process systematically through continuous planning, monitoring, and evaluation (Pintrich, 2004; Zimmerman, 2002). When students are able to manage the learning process effectively, they tend to have a clearer work structure, thereby reducing their tendency to postpone tasks (Wolters, 2003; Zimmerman & Schunk, 2011).

In the context of senior undergraduates, self-regulation skills become increasingly crucial due to the complexity of the academic tasks they face. Long-term, loosely structured final projects require students to independently manage their work pace (Zimmerman, 2008). An inability to engage in self-regulation is often the primary trigger for academic procrastination (Sirois, 2014; Steel, 2007).

Furthermore, the results of this study reinforce the assumption that academic procrastination is a form of failure

in self-regulation. Students who lack clear learning strategies tend to experience cognitive and behavioral disorganization, which ultimately leads them to postpone academic work (Steel, 2007; Tuckman, 1991). Thus, procrastination can be understood as a manifestation of weak self-control in an academic context (Zimmerman, 2000).

However, this study also shows that self-regulated learning does not operate in isolation. Its influence on academic procrastination is partially mediated by self-efficacy, which acts as a psychological mechanism bridging ability and behavior (Hwang & Oh, 2021; Klassen et al., 2008). This underscores the need to understand cognitive-regulatory aspects alongside motivational aspects (Pintrich, 2004).

Self-efficacy in this study was found to play a significant role in determining how students respond to academic demands. Students with high levels of self-efficacy tend to demonstrate greater resilience in the face of difficulties and are less likely to procrastinate (Bandura, 1997; Zimmerman, 2002). Conversely, low self-efficacy is associated with the emergence of self-doubt, which drives avoidance behavior (Klassen et al., 2008; Wäschle et al., 2014).

Based on social cognitive theory, self-efficacy influences an individual's choice of actions, level of effort, and persistence in the face of challenges (Bandura, 1997). In an academic context, students who believe in their abilities will be more proactive in completing assignments, while those who doubt themselves tend to avoid these tasks through procrastination (Schunk, 1995; Zimmerman, 2000).

This dynamic suggests that academic procrastination is not only related to a sense of "inability" but also to "uncertainty." In other words, even if students possess adequate cognitive abilities, without strong self-confidence, they are still likely to procrastinate (Steel, 2007; Wäschle et al., 2014). This underscores the importance of integrating ability and self-confidence in explaining academic behavior (Bandura, 1997).

Furthermore, the positive relationship between self-regulated learning and self-efficacy suggests that self-regulation serves as a source for the development of self-confidence. When students successfully manage their

learning process effectively, they gain experiences of success that reinforce their perception of self-competence (Bandura, 1997; Usher & Pajares, 2008). This process creates a positive cycle that strengthens students' academic readiness (Zimmerman, 2000).

Within this framework, self-regulated learning can be viewed as the structural foundation, while self-efficacy functions as the motivational energy that drives behavior (Zimmerman & Schunk, 2011). Both work synergistically to influence the tendency to procrastinate (Wolters, 2003). When these two factors develop optimally, the likelihood of procrastinatory behavior decreases (Steel, 2007).

The mediating role of self-efficacy in this study indicates that the relationship between self-regulated learning and academic procrastination is not entirely direct. There is a psychological pathway that strengthens or weakens this influence, namely through an individual's belief in their own abilities (Hayes, 2013; Hwang & Oh, 2021). This enriches our understanding of the internal mechanisms underlying procrastination behavior (Pintrich, 2004).

Interestingly, the direct effect of self-regulated learning on procrastination remains significant, indicating that self-regulation plays an independent role in controlling procrastination behavior (Steel, 2007; Wolters, 2003). Thus, there is a dual pathway in this model: a direct pathway through self-regulation and an indirect pathway through self-efficacy (Klassen et al., 2008).

In a systemic perspective, these three variables form a dynamic system in which they influence one another. Self-regulated learning enhances self-efficacy; self-efficacy reduces procrastination; and low levels of procrastination enable individuals to be more consistent in applying self-regulation strategies (Bandura, 1997; Zimmerman, 2000). These interactions create an adaptive cycle that supports academic success (Zimmerman & Schunk, 2011).

Conversely, if any one component of this system weakens, it can trigger a maladaptive cycle. For example, low self-efficacy can hinder the implementation of self-regulation strategies, which ultimately increases procrastination (Steel, 2007; Wäschle et al., 2014). This situation indicates that interventions must be comprehensive, not partial (Pintrich, 2004).

The theoretical implications of this study are the reinforcement of an integrative model in educational psychology that combines cognitive, motivational, and behavioral aspects (Pintrich, 2004; Zimmerman, 2000). This model provides a more comprehensive framework for understanding academic procrastination compared to approaches that focus on only one variable (Steel, 2007).

From a methodological perspective, the use of SEM-PLS allows for the simultaneous testing of complex relationships among variables, including mediating effects (Hair et al., 2019). This contributes to the development of more accurate predictive models in the context of students' academic behavior (Henseler et al., 2015).

In practical terms, these findings emphasize the importance of developing intervention programs focused on

enhancing self-regulated learning and self-efficacy (Schunk, 2003; Zimmerman & Schunk, 2011). Such interventions can be implemented through training in learning strategies and time management, as well as by strengthening self-confidence through structured experiences of success (Bandura, 1997).

In the context of higher education, instructors play a strategic role in shaping these two variables through adaptive instructional design (Zimmerman, 2002). Structured assignments, constructive feedback, and ongoing academic support can help students develop self-regulation and self-confidence (Pintrich, 2004).

Furthermore, a supportive learning environment also plays a role in strengthening students' self-efficacy (Usher & Pajares, 2008). An environment that provides opportunities to try, fail, and learn from experience will encourage students to be more confident in facing academic challenges (Bandura, 1997).

The findings of this study are also relevant in the context of improving the quality of college graduates. Students with high levels of self-regulation and self-confidence are not only able to complete their studies on time but are also better prepared to face the challenges of the workforce (Zimmerman, 2008).

However, this study has limitations, particularly in its use of a cross-sectional design, which does not allow for the examination of causal relationships longitudinally (Creswell, 2014). Therefore, future research is recommended to use a longitudinal design to understand the dynamics of changes in variables over time (Little, 2013).

Furthermore, this study focused only on three main variables, so it is possible that other factors influence academic procrastination, such as emotional regulation, academic stress, or social support (Sirois, 2014; Wolters, 2011). Future research could develop a more complex model by incorporating these variables.

Overall, this study makes an important contribution to our understanding of academic procrastination as a multidimensional phenomenon influenced by the interaction between self-regulation abilities and individual beliefs (Steel, 2007; Zimmerman, 2000). The systemic approach used in this study allows for a deeper understanding of the psychological mechanisms underlying this behavior (Bandura, 1997).

CONCLUSION

Academic procrastination among senior students is significantly influenced by the dynamics of the relationship between self-regulated learning and self-efficacy. Self-regulated learning serves as a key factor that not only directly reduces academic procrastination but also indirectly does so by enhancing self-efficacy. Self-efficacy has been shown to function as a partial mediator bridging this relationship, thereby strengthening the influence of self-regulated learning in reducing the tendency to procrastinate.

Thus, the greater a student's ability to regulate their learning process, the stronger their academic self-efficacy, which ultimately contributes to a reduction in academic procrastination. These findings underscore that efforts to

address academic procrastination must be comprehensive, integrating the development of self-regulation skills and the strengthening of self-efficacy into the students' learning process.

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ETHICAL APPROVAL

This study was conducted in accordance with the ethical principles for research involving human participants and received ethical approval from the relevant institutional ethics committee. The study complied with institutional ethical guidelines, and informed consent was obtained from all participants before data collection.

DECLARATION OF INTEREST

The authors declare that there are no financial, personal, or professional conflicts of interest that could have influenced the conduct or reporting of this research.

TRANSPARENCY OF DATA

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable ethical and confidentiality considerations.

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AUTHORS' CONTRIBUTION

The authors contributed to the conceptualization of the research, the research design, the development of the methodology, data collection, data analysis, interpretation of the findings, and manuscript preparation.

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