



## The Role of Self-Regulated Learning in Mediating the Relationship between Smartphone Usage Intensity and High School Students' Academic Motivation

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**ABSTRACT:** Digital technology has made smartphones an essential part of students' lives. Although smartphones can aid learning, excessive use can distract students and decrease their engagement in learning. A quantitative method with a mediation model for a correlational design using multiple linear regression analysis was used in this study. The purpose of this study is to explain the role of self-regulated learning in mediating the relationship between smartphone usage intensity and academic motivation of high school students. A total of 395 high school students were randomly selected from the high school student population. The scales used for data collection included a smartphone usage intensity scale, a self-regulated learning scale, and an academic motivation scale. The research results show that 1) the intensity of smartphone use significantly affects self-regulated learning by 30.3%, 2) academic motivation significantly affects self-regulated learning by 20.8%, and 3) self-regulated learning significantly affects the intensity of smartphone use and academic motivation. Followed by an F regression value of 15.392. An Rsquared value of 0.073 indicates that self-regulated learning contributes 70.3% to the intensity of smartphone use and academic motivation. Smartphone use intensity and academic motivation are considered significant predictors of the variation in selfregulated learning among high school students. The pattern of smartphone use and the level of academic learning drive influence students' ability to independently plan, monitor, and evaluate their learning process.

**KEYWORDS:** Academic motivation, self-regulated learning, smartphone usage intensity

### INTRODUCTION

Data shows that people in Indonesia tend to become addicted to smartphones. Excessive smartphone use can lead to negative effects such as depression, anxiety, and sleep disturbances (Rozgonjuk et al., 2021). The development of digital technology in the last decade has made smartphones an inseparable part of the lives of teenagers, including high school students. Statistical survey results on smartphone addiction in adolescents show that compared to adolescents who spend only one hour using electronic devices daily, those who spend five hours or more per day using electronic devices are 71% more likely to exhibit risk factors for suicide. 85% of the teenagers surveyed admitted it was difficult to stop using technology, such as the internet and smartphones, once they started. 67% of teenagers reported losing sleep due to late-night phone or internet use. Furthermore, the survey results in Indonesia also show that adolescents (13–18 years old) are the group with the highest increase in internet and device usage frequency, with over 70% of Indonesian adolescents recorded as active smartphone users (Andrianie et al., 2025).

Ownership and use of smartphones among junior and senior high school students in Indonesia indicate that the majority of students own their own smartphones and use them not only for communication but also for entertainment, social media, and, to some extent, for learning purposes. This study is based on primary data collected from a survey of 1,157 students in two junior high schools and two senior high schools from two different regions in Indonesia. Ownership and use of mobile devices vary significantly among students based on gender, age, location, and most importantly, socioeconomic status. (Pratama, 2019)

On the other hand, international reports, such as the OECD thru PISA 2022 and thematic reports on "students, digital devices and success," highlight that the use of digital devices in and out of school brings a paradox: on the one hand, it can support access to learning, while on the other hand, it is a significant source of distraction. Students who reported being frequently distracted by digital device use, both by themselves and their peers, scored lower academically than students who were rarely distracted (<https://www.oecd.org/2024>).



This aligns with studies on "digital distraction" which show that notifications, multitasking, and the habit of repeatedly checking smartphones can disrupt concentration, trigger academic procrastination, and reduce the quality of learning engagement (Parez-Juarez, Ortega & Perez, 2023). Various recent studies also indicate that high smartphone usage intensity, particularly when it tends toward problematic use or smartphone addiction, correlates with a decline in academic performance, increased academic anxiety, and the emergence of procrastination behavior and a decrease in the mental health quality of adolescents (Zhang & Zheng, 2024).

Research on smartphone addiction in adolescents found negative impacts on family communication, school adjustment, and learning behavior. The results showed that smartphone addiction significantly contributed to a decline in the quality of students' family communication. This means that school counselors must collaborate with subject teachers in creating and implementing programs to reduce negative effects, improve communication skills, and enhance learning effectiveness by using smartphones as a learning medium, rather than restricting smartphone use both at home and in the classroom (Atmoko et al., 2022).

However, reports from the OECD and UNESCO also indicate that moderate use of digital devices for learning purposes is actually associated with higher learning outcomes and a greater sense of belonging, while excessive use for entertainment tends to be linked to decreased performance and school engagement (<https://www.oecd.org/2024>). This shows that the issue isn't simply whether or not students have smartphones, but rather how the intensity and quality of their usage is managed.

The phenomenon is increasingly evident that high school students frequently use smartphones during lessons, even before bed. Distracted focus, reduced study time, and mental fatigue are caused by smartphone disruptions such as notifications, the urge to check apps, and scrolling thru social media. Excessive smartphone use is also linked to poor sleep quality, while poor sleep quality is also associated with decreased attention, memory, and desire to learn in adolescents.

One of the main factors in students' success in the learning process is academic motivation, which includes internal and external drives to participate in learning tasks, persist, and achieve success. It has been shown to be related to adolescents' study efforts, learning strategies, and academic achievement. (Badawi & Gezgin, 2025). However, post-pandemic reports show that many students are no longer enthusiastic about learning, feel distracted by electronic devices, and experience conflict between their need to study and their desire to play games, consume social media content, and seek entertainment. (<https://www.hm.ee/PISA> 2022).

The decline in the desire to learn has become a major problem for the world of education. Many students feel unmotivated, lack a sense of purpose, and easily get lost in the digital environment. The abundance of social media exposure, instant culture, and pressure to present a certain image today affects academic motivation, which is an important predictor of learning outcomes. Studies show that excessive smartphone use for entertainment is correlated with academic laziness, decreased learning interest, and procrastination. Many high school students lack the ability to self-regulate, especially when they are heavily exposed to technology. When they can't control themselves, excessive smartphone use is more likely to turn into something unpleasant, which in turn reduces academic motivation.

The self-regulated learning theory developed by Zimmerman and Pintrich states that students with self-regulation skills will set learning goals, choose appropriate learning strategies, track progress, and reflect on and adjust to task demands (Zimmerman, 2002). Recent studies show that self-regulated learning is positively correlated with academic achievement, learning skills, and the desire to learn among high school students (Daniela, 2015). It has been proven that a self-regulated learning intervention program improves knowledge and self-regulation skills in the planning and execution phases of learning (Aripin, Safitri & Megarini, 2023).

Recent studies have found a relationship between smartphone use and self-regulated learning strategies and academic success. Research on the role of smartphones in academic success and self-regulated learning found that high frequency of smartphone use, especially for non-academic activities, was associated with lower use of SRL strategies and lower learning outcomes. Conversely, directed smartphone use supported by self-regulated learning can reduce the negative effects of distraction (Hartley, Bandixen, & Glanoutsos, 2020). Recent studies show that students with high self-regulated learning are less likely to be easily distracted by smartphones, are able to manage study time effectively, have stable academic motivation, and are more resilient to learning difficulties. However, these abilities do not develop automatically.

The research results indicate that (1) social media addiction has a positive effect on academic procrastination, (2) social media addiction has a negative effect on self-regulated learning, (3) self-regulated learning has a negative effect on academic procrastination, and (4) there is an indirect effect of social media addiction on academic procrastination thru the mediation of



selfregulated learning. Additional studies have found that social media addiction leads to academic procrastination; SRL serves as a mediator connecting addiction tendencies with task procrastination behavior (Nurmaidah, Marsofiyati, & Wolor, 2025).

Based on this description, it appears that the intensity of smartphone use can influence adolescents' academic motivation. However, the strength of this influence may not be direct and could be affected by internal psychological elements such as selfregulated learning. In Indonesia, there is much research studying the use of smartphones and learning outcomes, but only a few studies specifically investigate the mediating role of self-regulated learning in the relationship between the intensity of smartphone use and the academic motivation of high school students (Yanti, Wijaya & Sholeh, 2024).

## METHODS

This research falls into the category of data explanation research and uses a quantitative approach. The research data analysis uses multiple linear regression analysis, a statistical technique for understanding the influence of two or more independent variables on a single dependent variable, and for predicting the value of the dependent variable based on those independent variables. The goal is to model the linear relationship between the predictor (X) and the response (Y) to gain a more comprehensive understanding than simple linear regression (one predictor). Explaining the role of self-regulated learning as a dependent variable in relation to smartphone usage intensity and academic motivation.

### Sample Characteristics

One operational definition of each variable is as follows: Academic motivation (dependent) is the internal and external drive that encourages high school students to engage, strive, and persevere in academic activities to achieve their academic goals. High school student engagement in using smartphones is defined as the intensity of smartphone use (independent). This is measured by counting the frequency, duration, and motivation to use it, as well as how it affects their learning activities and daily lives. And Self-Regulated Learning (mediator) is the ability of high school students to plan, monitor, regulate, and self-evaluate their own learning activities. This includes cognitive, behavioral, and motivational regulation. The characteristics of the participants are high school students, grades 1 to 3, aged between 15 and 17, and smartphone users.

### Sampling Technique

This research involved 395 high school students from three public high schools, with a total of 3,232 students. The simple random sampling technique, which is a sampling technique from a population that gives each member of the population an equal chance of being selected as a sample, was used in this study. The sample size of 395 students was calculated based on the Slovin's formula with an error rate of 5%. To ensure that every student had an equal opportunity during the sampling process, the researchers first collected a list of all students from the three schools, consisting of 1,315 students at SMA A, 871 students at SMA B, and 1,046 students at SMA C. The population list contained student identities such as student identification number (NIS), grade, and year of entry. They are between 15 and 18 years old, in grades X, XI, and XII, and are male and female. Their social and academic backgrounds are diverse, reflecting the distribution of students in the school.

### Measurement

This research uses three types of psychological scale instruments with a Likert 1–5 model (Strongly Disagree - Strongly Agree). This instrument includes the Smartphone Usage Intensity Scale, which is an adaptation of the Short Version of the Smartphone Addiction Scale (SAS-SV) and the Smartphone Usage Pattern Indicator (Kwon, M., Kim, D.-J., Cho, H., & Yang, S., 2013). Among the dimensions of frequency, duration, urge to use, learning impairment, and inappropriate use, there are twelve items. The Scale of Self-Regulated Learning (SRL), which was modified from the Motivated Strategies for Learning Questionnaire (MSLQ), consists of 15 items representing indicators for planning, time and environment management, monitoring, strategies and effort, and reflection. (Pintrich, P. R., Smith, D. A. F., García, T., & McKeachie, W. J., 1991). The Academic Motivation Scale, which was modified from the AMS, consists of 12 items indicating indicators for intrinsic, extrinsic, and amotivation. (Vallerand, R. J., et al., 1992).

## DISCUSSION

The research findings indicate that the intensity of smartphone use is significantly related to students' academic motivation, both directly and indirectly thru self-regulated learning. Self-regulated learning is estimated to act as a mediator, explaining how



students' ability to regulate their learning process can weaken or strengthen the impact of smartphone use on academic motivation.

1. Hypothesis 1: The significance value for smartphone usage intensity was found to be  $p = 0.001$  ( $<0.05$ ), therefore it is concluded that smartphone usage intensity significantly affects self-regulated learning in high school students. The R Square value of 0.033 means that the contribution of the smartphone usage intensity variable to self-regulated learning is 30.3%. 2. Hypothesis 2: The significance value for academic motivation was found to be  $p = 0.001$  ( $0.05$ ), therefore it is concluded that academic motivation significantly affects self-regulated learning in high school students. The R Square value of 0.028 means that the contribution of the academic motivation variable to self-regulated learning is 20.8%.

**Table 1. Correlation Coefficient of Self-Regulated Learning against Smartphone Usage Intensity**

Model		Coefficients <sup>a</sup>				Sig.
		Unstandardized Coefficients		Standardized Coefficients	t	
		B	Std. Error	Beta		
1	(Constant)	66.807	2.141		31.201	<.001
	Intensity of smartphone usage	-.200	.055	-.180	-3.637	<.001

a. Dependent Variable: Self-regulated learning

**Table 2. Analysis of self-regulated learning data against smartphone usage intensity**

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.180 <sup>a</sup>	.033	.030	7.66318

a. Predictors: (Constant), Intensity of smartphone usage

**Table 3. Correlation Coefficient of Self-Regulated Learning to Academic Motivation**

Model		Coefficients <sup>a</sup>				Sig.
		Unstandardized Coefficients		Standardized Coefficients	t	
		B	Std. Error	Beta		
1	(Constant)	44.867	4.272		10.502	<.001
	Academic motivation	.332	.099	.167	3.356	<.001

a. Dependent Variable: Self-regulated learning

**Table 4. Analysis of self-regulated learning data against academic motivation**

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.167 <sup>a</sup>	.028	.025	7.68177

a. Predictors: (Constant), Academic motivation

3. The third hypothesis states that the significance value of Self-regulated learning on the variables of smartphone usage intensity and academic motivation is 0.001 ( $<0.05$ ), therefore it is concluded that self-regulated learning significantly influences smartphone usage intensity and academic motivation. Followed by an F regression value of 15.392. The R Square value of 0.073 means that the contribution of self-regulated learning variables to the intensity of smartphone use and academic motivation is 70.3%. This indicates that smartphone use intensity and academic motivation are considered significant predictor factors contributing to the variation in



self-regulated learning among high school students, where smartphone usage patterns and the level of academic learning drive influence students' ability to independently plan, monitor, and evaluate their learning process. The coefficient data can be seen in Tables 5 and 6 below:

**Table 5. Regression correlation coefficients of self-regulated learning variables against smartphone usage intensity and academic motivation.**

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	50.863	4.398		11.565	<.001
	Intensity of smartphone usage	-.238	.055	-.215	-4.359	<.001
	Academic motivation	.404	.098	.204	4.125	<.001

a. Dependent Variable: Self-regulated learning

**Table 6. Data analysis of self-regulated learning against smartphone usage intensity and academic motivation**

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	.270 <sup>a</sup>	.073	.068	7.51164	

a. Predictors: (Constant), Academic motivation, Intensity of smartphone use

**Table 7. Regression analysis of self-regulated learning variables against smartphone usage intensity and academic motivation**

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1736.968	2	868.484	15.392	<.001 <sup>b</sup>
	Residual	22118.516	392	56.425		
	Total	23855.484	394			

a. Dependent Variable: Self-regulated learning  
b. Predictors: (Constant), Academic motivation, Intensity of smartphone use

Smartphones are a controversial digital environmental stimulus from an educational psychology perspective. This has the potential to support learning on one hand, but it can also be distracting. Excessive smartphone use, especially for non-academic activities, is associated with poor time management for studying, increased multitasking, and decreased attention control (Chen & Yan, 2016; Sunday et al., 2021; Lepp et al., 2019). The research findings indicate that the intensity of smartphone use significantly influences self-regulated learning (SRL) by 30.3%. This finding supports the view that patterns of digital technology use, particularly smartphones, have a direct impact on high school students' self-regulated learning abilities. According to Zimmerman's (2013) Self-Regulated Learning model, self-regulation requires students to plan learning goals (forethought), monitor focus and strategies during learning (performance), and conduct self-evaluation and reflection (self-reflection). Because notifications, social media, and entertainment content distract from learning, excessive smartphone use tends to disrupt the achievement phase. As shown by studies conducted by Rosen et al. (2018) and May & Elder (2018), students who are frequently distracted by smartphones while studying experience a decrease in the efficiency of their learning strategies and metacognitive control. This condition aligns with the findings of this study, which indicate that the frequency of smartphone use is a primary factor explaining differences in high school students'



SRL. However, the research shows that the real issue is not the existence of smartphones themselves, but how students use them correctly (OECD, 2021; Panadero, 2017). Students with low SRL tend to use smartphones impulsively and without planning, while students with high SRL can regulate when and for what they use their smartphones.

According to Self-Determination Theory (Deci & Ryan, 2017), students with high intrinsic motivation will be more engaged in learning, more persistent, and more likely to use adaptive learning strategies. Academic motivation empowers students with psychological strength to set significant educational goals, persevere through challenges, and reflect on what they learn. Recent studies (Schunk & Greene, 2018; Mega et al., 2019; Broadbent & Poon, 2015) have found that students with high academic motivation use SRL strategies such as study planning, time management, and comprehension monitoring more frequently. Students with low academic motivation tend to be passive, give up easily, and rarely self-evaluate. For high school students, academic motivation is also closely linked to academic pressure, parental expectations, and their future goals. Students who lack academic motivation tend to seek instant gratification through smartphones and social media. When this happens, their ability to control themselves in learning becomes worse. This study strengthens the assumption that academic motivation is not only a result of SRL but also an important predictor that drives the emergence of SRL.

Psychologically, these findings can be explained through the reciprocal determinism approach (Bandura, 2018), which states that individual factors (such as academic motivation), behavior (such as smartphone use), and self-regulation dynamically influence each other. Self-regulated learning serves as a linking or mediating mechanism that explains how smartphone use and academic motivation interact to influence students' learning processes. The research results indicate that self-regulated learning significantly affects the intensity of smartphone use and academic motivation, with an F-value of 15.392 and an R-squared value of 0.073, which is interpreted as a meaningful contribution to explaining the relationship between variables. Previous research supports the mediating role of self-regulated learning in digital technology. According to research conducted by van Deursen et al. (2015) and Huang (2022), students with good self-regulation skills can control digital distractions and direct their technology use toward productive activities.

Meanwhile, Zhang et al. (2020) found that Self-Regulated Learning moderates the relationship between smartphone addiction and academic engagement. In this study, the intensity of smartphone use and academic motivation are viewed as significant predictor factors contributing to the variation in self-regulated learning among high school students. This means that students who use smartphones intensively without control and have low academic motivation are likely to experience difficulties in independently planning, monitoring, and evaluating their learning process. Conversely, strong academic motivation can strengthen SRL, so smartphone use is not always negative and can even be utilized as a learning resource. Previous studies also support the role of SRL as a link between technology use and learning outcomes. For example, research by Zhang, Chen, and Hu (2021) found that self-regulated learning mediates the relationship between academic procrastination and social media addiction. The results are consistent with previous research findings, which identify self-regulated learning as an important variable in explaining how students learn in the smartphone era.

Theoretically, the findings of this study support Zimmerman's social-cognitive model, which emphasizes the reciprocal relationship between individual factors such as motivation, behaviors such as smartphone use, and self-regulation. This result also expands SRL research into the context of digital learning for high school students, which is still relatively limited, especially in Indonesia. Contextually, this research indicates that improving students' educational quality is not sufficient by simply limiting smartphone use; it is also necessary to enhance self-regulated learning abilities and academic motivation. This method is more suitable for the digital lives of teenagers today.

## CONCLUSION

Based on the research findings and discussions presented, it can be concluded that autonomous learning plays a very important role in explaining the relationship between the intensity of smartphone use and students' academic motivation in high school. High and uncontrolled smartphone use can weaken students' ability to plan, monitor, and improve their learning. Students with strong academic motivation tend to be more capable of independently and adaptively regulating their learning behavior, including managing smartphone use in accordance with academic demands and digital distractions. Additionally, the research findings indicate that smartphone usage patterns and academic motivation levels can be considered significant predictors contributing to the variation in students' self-regulated learning in high school. Smartphone usage patterns and academic motivation levels influence the extent to which students are able to manage their learning in the internet era. Therefore, this research indicates



that an important method for improving students' learning quality amidst the rapid advancement of digital technology is to enhance self-regulated learning. It is hoped that educational efforts centered on academic motivation and selfregulation skills will help students use smartphones more wisely and productively to support their academic success.

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