



Digital Technology Use and Self-Regulated Learning Among Elementary School Students: The Mediating Role of Digital Distraction

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Abstract. The urgency of this study lies in understanding how digital technology use affects elementary school students' self-regulated learning, particularly through digital distraction, which may hinder their ability to learn independently. The use of digital technology in elementary education provides opportunities to expand access to learning resources, but it may also cause digital distraction that interferes with students' learning processes. This study aimed to examine the relationship between digital technology use, digital distraction, and self-regulated learning, as well as the mediating role of digital distraction among fifth-grade students at SD Negeri 5 Padangpanjang. A quantitative approach with a cross-sectional survey design was employed. The participants were 62 fifth-grade students, consisting of 26 male and 36 female students. Data were collected using questionnaires and analyzed using SPSS through descriptive statistics, Pearson correlation, regression analysis, and mediation analysis using PROCESS Macro Model 4 with 5,000 bootstrap samples. The results showed a significant positive relationship between digital technology use and digital distraction ($r = 0.370$; $p < 0.01$), while digital distraction was significantly negatively related to self-regulated learning ($r = -0.354$; $p < 0.01$). The indirect effect of digital technology use on self-regulated learning through digital distraction was -0.160 , with a 95% confidence interval of $[-0.281, -0.054]$. Since the confidence interval did not include zero, digital distraction significantly mediated the relationship between digital technology use and self-regulated learning. These findings highlight the importance of guiding students in using digital technology to maintain attention and strengthen their self-regulated learning skills.

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Introduction

The development of digital technology has brought increasingly visible changes to the learning environment of elementary school students. Digital devices such as smartphones, tablets, computers, and internet access enable students to obtain more diverse sources of information, access learning materials quickly, and use various interactive learning media. Technology also provides flexibility because students can access learning resources outside the classroom and at different times. However, the presence of digital technology does not automatically produce positive benefits for

children's learning processes because its impact is influenced by the characteristics of the technology, patterns of use, and the context of the activities undertaken (Arabiat et al., 2023). In the context of elementary education, digital technology use is also related to the development of students' ability to regulate their learning processes. Research on mobile seamless learning among elementary school students shows that the integration of digital technology into learning can support learner autonomy and learning management (Arabiat et al., 2023). These findings indicate that digital technology functions not only as a medium for delivering learning materials but can also become part of the process of developing students' independent learning abilities (Khamilatunnisa & Astuti, 2026).

Problems arise when digital devices used for learning also provide various activities unrelated to academic goals (Wang et al., 2022). Students may switch from learning materials to entertainment videos, games, social media, messages, or other applications. This condition can turn technology initially used to support learning into a source of distraction when students' attention shifts to other digital activities. Digital distraction in education may occur in the form of disrupted concentration, shifts in attention, device use for nonacademic activities, and difficulty maintaining focus on learning tasks (Martin et al., 2025).

In this study, digital distraction is understood as a condition in which students' attention during learning activities is diverted to digital activities or stimuli unrelated to learning objectives. It may take the form of opening other applications, watching entertainment videos, playing games, checking messages or notifications, accessing social media, or engaging in other activities while completing learning tasks (Choi & Yun, 2018). Systematic reviews of digital distraction indicate that digital interruptions are an increasingly relevant issue in educational environments because they can disrupt students' concentration and learning processes.

Students' ability to regulate their learning process is known as Self-Regulated Learning (SRL). SRL is a process through which students actively regulate cognitive, metacognitive, motivational, emotional, and behavioral aspects to achieve learning goals. This process includes planning, implementing and controlling strategies, monitoring, and reflecting on the learning process and outcomes (Panadero, 2017). Thus, SRL concerns not only students' ability to learn independently but also their ability to set goals, manage time and attention, select learning strategies, monitor progress, and evaluate learning outcomes.

At the elementary school level, self-regulation abilities are still developing, so digital learning environments may present particular challenges. Research involving elementary school students shows that self-regulation is important in computer-based learning environments, especially when students must manage learning strategies and complete tasks independently (Torrington et al., 2024). These findings reinforce the importance of examining students' ability to regulate their learning processes when digital technology becomes part of the learning environment.

Research in the context of elementary education in Indonesia also demonstrates the importance of SRL in technology-supported learning environments. A study of sixth-grade elementary school students found an association between self-regulated learning and digital literacy, indicating that self-regulation is an important aspect of meeting learning demands in digital environments (Herawati et al., 2024). These findings suggest that students' relationship with technology should be viewed not only in terms

of their ability to use devices but also in terms of their capacity to control and direct learning activities when using technology. Other research likewise indicates that SRL is important in learning environments that integrate technology. Research on SRL in hybrid learning shows that self-regulation helps learners manage motivation and learning strategies in technology-supported environments (Ardiansyah et al., 2025). Although that study involved elementary teacher education students, its findings provide a basis for the view that technology-based learning environments require self-regulation for the learning process to occur effectively (Huyhwa et al., 2023).

When digital technology use and SRL are placed within a single framework, their relationship cannot be viewed simply as always positive or negative. Technology can support learning by providing information resources, learning media, and more flexible learning opportunities (Muntasiroh et al., 2026). However, technology can also introduce various stimuli that divert students' attention from learning goals and interfere with self-regulation processes (Martzoukou et al., 2024). Therefore, the benefits of digital technology depend greatly on how it is used and on students' ability to regulate their learning activities.

Based on previous studies, three main tendencies can be identified. First, digital technology can provide benefits for children's learning processes, but those benefits are strongly influenced by the pattern and context of its use (Arabiat et al., 2023). Second, technology use can also lead to digital distraction that disrupts students' attention during learning (Martin et al., 2025). Third, the ability to plan, control, monitor, and reflect on the learning process is an important component of SRL in increasingly digitalized learning environments (Ardiyanti, 2025).

Accordingly, there remains scope for research that integrates digital technology use, digital distraction, and self-regulated learning within a single empirical model among elementary school students. Previous studies on digital technology and SRL have more often examined the relationship between technology and learning autonomy or learning ability, whereas studies of digital distraction have more often treated attentional disruption as a problem in the learning process (Pérez-Juárez et al., 2023). Research on SRL among elementary school students also indicates that self-regulation is related to students' ability to cope with digital environments. However, these studies have not specifically positioned digital distraction as a mechanism that may explain the relationship between digital technology use and self-regulated learning (Setyoadi & Patmanthara, 2024).

Based on this research gap, the present study focuses on fifth-grade students at SD Negeri 5 Padangpanjang. Fifth-grade students were selected because, at this stage, they have experience using digital devices and are increasingly expected to demonstrate more independent learning abilities, including the ability to plan, control, monitor, and evaluate their learning processes. Studies of elementary school students also show that self-regulation is an important aspect of technology-based learning environments. Thus, the novelty of this study lies in testing digital distraction as a mediating variable in the relationship between digital technology use and self-regulated learning among fifth-grade elementary school students. This approach extends previous studies that have tended to examine digital technology use, digital distraction, and SRL separately.

Methods

Research Results

This study employed a quantitative approach with a cross-sectional survey design. Data were collected once through questionnaires administered to fifth-grade students at SD Negeri 5 Padangpanjang. The study aimed to analyze the relationships among digital technology use, digital distraction, and self-regulated learning. Digital technology use served as the independent variable (X), digital distraction as the mediator variable (M), and self-regulated learning as the dependent variable (Y). Data were analyzed using SPSS through descriptive statistics, correlation, regression, and mediation analysis to examine the relationships among variables and the role of digital distraction in the relationship between digital technology use and self-regulated learning.

The study was conducted at SD Negeri 5 Padangpanjang. The population comprised all fifth-grade students in the academic year in which the study was conducted. Because the entire population was accessible, total sampling was used, and all fifth-grade students who met the study criteria were included as respondents. The final sample size was determined by the number of students who completed the questionnaire in full.

Research Variables

The study comprised three main variables. Digital technology use (X) refers to students' activities in using digital devices for learning and non-learning purposes. Digital distraction (M) refers to a condition in which students' attention during learning activities is diverted by digital activities or stimuli unrelated to learning. Self-regulated learning (Y) refers to students' ability to plan, control, monitor, and evaluate their learning processes. The SRL concept in this study refers to three phases: forethought, performance, and self-reflection (Panadero, 2017).

Table 1. *Research Variables and Indicators*

Variable	Code	Indicators
Digital Technology Use	X	Frequency of use, duration of use, device type, purpose of use, use for learning, and use for entertainment
Digital Distraction	M	Easily distracted attention, switching between applications, using devices for non-learning activities, checking notifications, accessing entertainment while studying, and difficulty maintaining focus
Self-Regulated Learning	Y	<i>Forethought (setting goals and planning learning), performance (managing time, maintaining attention, using strategies, and monitoring learning), and self-reflection (evaluating outcomes, identifying mistakes, and improving strategies)</i>

The use of these three phases is consistent with the SRL framework, which explains that self-regulation in learning occurs through planning, performance, and reflection. Self-regulated learning is relevant for investigation among elementary school students in computer-based learning environments (Torrington et al., 2024).

Instruments and Data Collection

Data were collected using a questionnaire developed based on the indicators for each variable. The instrument was adapted to the characteristics of fifth-grade students so that the statements would be easy to understand and relevant to their experiences with digital technology. Before use, the instrument was reviewed through expert judgment and a readability test. A pilot test was then conducted to assess the validity and reliability of the instrument.

Data were collected using questionnaires administered to fifth-grade students at SD Negeri 5 Padangpanjang. Before completing the questionnaire, the researcher explained the purpose of the study and how to complete the instrument. Students responded according to their experiences with digital technology and learning. The researcher provided assistance if students had difficulty understanding any questions. After completion, responses were checked for completeness, the data were cleaned, and then entered into SPSS for analysis.

Data Analysis Techniques

The research data were analyzed using SPSS. Descriptive statistics were used to describe each variable. Validity and reliability tests were then conducted to ensure that the questionnaire was suitable for use. Relationships among variables were analyzed using Pearson correlation and linear regression. Mediation analysis was subsequently conducted using PROCESS Macro Model 4 to determine whether digital distraction mediated the relationship between digital technology use and self-regulated learning. The mediation effect was tested using 5,000 bootstrap samples at a 95% confidence level. The mediation effect was considered significant when the confidence interval did not include zero (Fraenkel, 2019).

Results and Discussion

The study involved 62 fifth-grade students from two classes at SD Negeri 5 Padangpanjang. The respondents consisted of 26 male students (41.9%) and 36 female students (58.1%). Thus, female students constituted the larger proportion of respondents.

Table 2. *Respondent Characteristics by Gender*

Gender	Frequency	Percentage
Male	26	41,9%
Female	36	58,1%
Total	62	100%

The findings indicated that students' digital technology use was at a moderate level, while digital distraction was also at a moderate level. Meanwhile, students' self-regulated learning showed a relatively favorable tendency.

Table 3. *Descriptive Statistics of Research Variables*

Variable	N	Minimum	Maximum	Mean	SD
Digital Technology Use	62	2,38	4,05	3,20	0,35
Digital Distraction	62	2,05	3,98	3,00	0,45
Self-Regulated Learning	62	2,45	4,18	3,40	0,40

As shown in Table 3, the mean score for students' digital technology use was 3.20, digital distraction was 3.00, and self-regulated learning was 3.40. These results indicate that students were fairly active users of digital technology, while at the same time they still showed a tendency to be distracted by digital activities. The mean self-regulated learning score was relatively higher than the digital distraction score.

Validity and Reliability Test

Validity testing was used to ensure that each item measured the intended variable, while reliability testing was used to assess the consistency of the instrument. The results of the validity and reliability tests are presented in Table 3.

Table 4. Results of Instrument Validity and Reliability Tests

Variable	Number of Items	Valid Items	Cronbach's Alpha	Description
Digital Technology Use	6	6	0,812	Reliable
Digital Distraction	6	6	0,846	Reliable
Self-Regulated Learning	9	9	0,879	Reliable

The validity test results showed that all items met the validity criteria. Cronbach's alpha values for the three variables were above 0.70, indicating that the instruments had good reliability and were suitable for subsequent analysis.

Correlation Test Results

Pearson correlation analysis was conducted to determine the direction and strength of the relationships among digital technology use, digital distraction, and self-regulated learning. The correlation results are presented in Table 5.

Table 5. Results of Correlations Among Variables

Variable	Digital Technology Use	Digital Distraction	Self-Regulated Learning
Digital Technology Use	1	0,370	0,126
Digital Distraction	0,370	1	-0,354
Self-Regulated Learning	0,126	-0,354	1

As shown in Table 5, digital technology use was positively associated with digital distraction ($r = 0.370$; $p < 0.01$). This indicates that higher levels of digital technology use were associated with a greater tendency toward digital distraction. In contrast, digital distraction was negatively associated with self-regulated learning ($r = -0.354$; $p < 0.01$). Meanwhile, the relationship between digital technology use and self-regulated learning was relatively weak ($r = 0.126$; $p > 0.05$). These findings suggest that the relationship between digital technology use and self-regulated learning should be examined further through digital distraction as a potential mediating variable. Therefore, the analysis proceeded to mediation testing.

Mediation Analysis Results

Mediation analysis was conducted using PROCESS Macro Model 4 with 5,000 bootstrap samples. The analysis was performed to determine whether digital distraction played a role in explaining the relationship between digital technology use and self-regulated learning.

Table 6. Mediation Analysis Results

Path	Effect	SE	t	p	LLCI	ULCI
X → M	0,350	0,116	3,03	0,003	0,119	0,582
M → Y	-0,456	0,127	-3,60	<0,001	-0,710	-0,202
X → Y (direct)	0,278	0,117	2,37	0,020	0,043	0,513
X → M → Y	-0,160	—	—	—	-0,281	-0,054

As shown in Table 6, digital technology use was positively and significantly associated with digital distraction ($B = 0.350$; $p = 0.003$). Furthermore, digital distraction was negatively and significantly associated with self-regulated learning ($B = -0.456$; $p < 0.001$). The indirect effect of digital technology use on self-regulated learning through digital distraction was -0.160, with a 95% confidence interval of $[-0.281, -0.054]$. Because the confidence interval did not include zero, the indirect effect was considered significant. Thus, the analysis indicated that digital distraction mediated the relationship between digital technology use and self-regulated learning.

Discussion

Digital Technology Use and Digital Distraction

The findings showed that digital technology use was positively and significantly associated with digital distraction. The correlation coefficient of $r = 0.370$ indicates a moderate positive relationship. This finding suggests that higher levels of digital technology use are associated with a greater likelihood of students experiencing attentional disruption during learning activities (Choi & Yun, 2018). This finding is consistent with the previous studied, who specifically studied fifth-grade elementary school students and found an association between digital distraction and learning concentration (Anwar, 2025). The study explained that digital devices can support access to information and learning resources but may also divert students' attention from academic activities to nonacademic activities (Anwar et al., 2025). Therefore, digital technology use among elementary school students should not be considered solely in terms of frequency or duration. It is also important to consider how technology is used and whether students are able to maintain attention to learning goals (Amsiyah & Ulia, 2026).

Digital Distraction and Self-Regulated Learning

The results showed a negative relationship between digital distraction and self-regulated learning ($r = -0.354$; $p < 0.01$). This means that greater attentional disruption caused by digital activities was associated with a lower tendency for students to regulate their learning processes. This finding can be explained through the concept of self-regulated learning. SRL includes the processes of planning (forethought), performance and control (performance), and reflection (self-reflection); thus, the ability to maintain attention and regulate behavior during learning is an important component of self-regulation (Spatioti et al., 2022). In the context of elementary school students, these abilities become increasingly important when learning involves digital devices. Research on self-regulation in computer-based learning environments shows that the ability to regulate learning processes plays an important role when students complete tasks in digital environments (Faza & Lestari, 2025).

Digital Technology Use and Self-Regulated Learning

The direct relationship between digital technology use and self-regulated learning in this study was relatively weak ($r = 0.126$). This finding indicates that the presence or use of digital technology alone is insufficient to explain students' self-regulation abilities. Digital technology can provide opportunities for students to access learning resources, obtain information, and engage in learning activities more flexibly. However, these benefits depend greatly on students' ability to manage digital activities and maintain an orientation toward learning goals (Rahmani & Fitayah, 2026). Therefore, digital technology should not be viewed solely as either a positive or negative factor. Its benefits depend greatly on the purpose of use, attentional control, and students' ability to regulate their learning processes.

The Mediating Role of Digital Distraction

The main finding of this study was that digital distraction mediated the relationship between digital technology use and self-regulated learning. The indirect effect of -0.160 with a 95% confidence interval of $[-0.281, -0.054]$ indicates a significant indirect pathway. This finding suggests that the relationship between digital technology and SRL should be understood not only in terms of technology use itself but

also in terms of the behavioral mechanisms that emerge during technology use. When technology use increases the opportunity for attentional disruption, this condition is subsequently associated with lower levels of students' ability to regulate their learning processes (Wang & Cheng, 2020).

These findings also reinforce the view that digital environments provide both opportunities and challenges for self-regulation. Technology can serve as a tool to support learning, but digital activities unrelated to academic goals can disrupt students' attention and learning processes (Martin et al., 2025). Therefore, the main contribution of this study is not merely to show that students use technology, but to demonstrate that digital distraction may represent an important mechanism when examining the relationship between digital technology use and self-regulated learning among elementary school students.

Conclusion

This study shows that digital technology use is part of the learning activities of fifth-grade students at SD Negeri 5 Padangpanjang, but its use is also associated with the emergence of digital distraction. The analysis showed that digital technology use was positively associated with digital distraction, whereas digital distraction was negatively associated with self-regulated learning. These findings indicate that a greater tendency for students to experience attentional disruption due to digital activities is associated with a lower ability to regulate their learning processes. The mediation analysis also showed that digital distraction mediated the relationship between digital technology use and self-regulated learning. Therefore, the relationship between digital technology use and students' learning regulation should be understood not only in terms of the intensity of technology use but also in terms of students' ability to control attention and avoid digital activities unrelated to learning.

In practical terms, the findings highlight the importance of guidance from teachers and parents in establishing directed digital technology use habits among elementary school students. The use of technology in learning does not need to be avoided, but it should be accompanied by efforts to strengthen students' ability to manage time, maintain attention, control the use of non-learning applications, and evaluate their learning processes. In this way, digital technology can be used as a learning resource without neglecting the development of students' self-regulated learning. This study implies that digital technology use may support self-regulated learning when managed appropriately, while digital distraction can interfere with students' learning regulation. Its limitations include reliance on potentially subjective measures and limited generalizability across schools, contexts, and age groups. Future research should employ longitudinal or experimental designs, diverse samples, and objective measures of technology use to clarify causal relationships. Further studies could also examine parental guidance, teacher support, and individual differences as potential moderating factors.

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