Journal of Social Work and Science Education
Volume 7 (2) 2026, 1351-1365
E-ISSN 2723-6919, P-ISSN 2746-0827

Smartphone and Learning: Time Management as a Key Mediator of Negative Effects in High School Students

Efi Yanita Situmorang[1], Connie[1], Muhammad Kristiawan[1]
[1]Universitas Bengkulu, Bengkulu, Indonesia

Corresponding author e-mail: efi85topsatu@gmail.com

Article History: Received on 24 January 2026, Revised on 30 January 2026, Published on 7 April 2026

Abstract: The smartphone represents a double-edged sword in education a gateway to infinite knowledge that paradoxically fragments the very attention required for deep learning. This study investigates the direct and indirect effects of smartphone usage intensity on learning effectiveness, with study time management as a mediating variable, among high school students in Bengkulu City, Indonesia. Employing a quantitative mediation design, data were gathered from 75 students (N=75) at Pelita Kasih High School through total sampling. Validated Likert-scale questionnaires assessed all constructs, and hypotheses were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) mediation analysis with bootstrapping (5,000 resamples) in SmartPLS 4.0. Descriptive analysis indicates moderate smartphone usage intensity, alongside high levels of study time management and learning effectiveness. Path analysis reveals that smartphone usage intensity negatively affects learning effectiveness directly ($\beta = -0.337$, $p < 0.05$) and strongly diminishes study time management ($\beta = -0.689$, $p < 0.001$), which positively predicts learning effectiveness ($\beta = 0.520$, $p < 0.01$). The indirect effect ($\beta = -0.358$) compounds into a substantial total effect ($\beta = -0.695$). With a Variance Accounted For (VAF) of 51.51%, study time management partially mediates this relationship, revealing that over half of smartphone's detrimental influence operates through disrupted time management. The model explains 62.4% of learning effectiveness variance. These results establish time management as a pivotal buffer against smartphone-induced academic disruption. Practically, this study recommends that schools design comprehensive intervention frameworks integrating digital literacy education with structured time management training, thereby transforming smartphone use from a liability into an educational asset.

Keywords: Learning Effectiveness, Smartphone Usage Intensity, Study Time Management

A. Introduction

The global phenomenon of intensive smartphone usage among students presents a paradoxical challenge to educational effectiveness in the digital era. As one of the most dominant technological devices used by adolescents, smartphones have evolved

beyond communication tools into multifunctional platforms that support information access, digital learning, and creative expression. In educational contexts, smartphones offer flexibility and learning opportunities; however, uncontrolled usage frequently disrupts learning processes and diminishes learning effectiveness, which encompasses academic achievement, conceptual understanding, learning attitudes, and competency development (Darling-Hammond et al., 2020; Schunk & Zimmerman, 2012; Zimmerman & Schunk, 2022).

Comprehending the pathway through which smartphone engagement shapes learning outcomes demands a shift from isolated theoretical lenses toward a unified conceptual architecture that captures behavioral, temporal, and cognitive learning dimensions in concert. The present investigation therefore synthesizes Self-Regulated Learning Theory (Matthay et al., 2019), Time Management Theory (Macan, 1994; Claessens et al., 2007) and Cognitive Load Theory (Sweller, 2020)) as interlocking facets of one explanatory system rather than three standalone perspectives (see Figure 1). Imagine a student immersed in coursework when a smartphone alert appears: the choice to engage or dismiss it constitutes a self-regulatory trial, yet that very choice instantly triggers temporal repercussions minutes surrendered to distraction fracture continuous study and erode goal-oriented scheduling alongside cognitive repercussions the mental switching cost drains working memory resources otherwise reserved for substantive comprehension. Crucially, these three consequences unfold in tandem, reinforcing one another through a cascading dynamic wherein compromised self-regulation undermines structured time allocation, which subsequently elevates extraneous cognitive burden, culminating in diminished learning effectiveness.

Within this integrated architecture, study time management emerges as the critical mediating conduit linking smartphone behavior to academic results. Self-regulation governs whether learners can withstand device temptations; cognitive load theory clarifies why fragmented attention hampers retention; yet time management embodies the behavioral channel that transmits both influences toward outcomes. A learner who impulsively glances at notifications but adeptly reorganizes remaining study periods may offset part of the disruption; by contrast, one who chronically misallocates study hours will falter academically irrespective of occasional willpower. This theoretical synthesis yields a precise, testable assertion: smartphone usage intensity shapes learning effectiveness via dual simultaneous routes a direct route capturing immediate cognitive interference during task-switching, and an indirect route operating through the erosion of time management competencies. The partial mediation model examined herein encapsulates this dual-route mechanism, with the Variance Accounted For (VAF) index quantifying each pathway's proportional contribution to the aggregate effect.

Journal of Social Work and Science Education
Volume 7 (2) 2026, 1351-1365
E-ISSN 2723-6919, P-ISSN 2746-0827

Figure 1. Integrated Theoretical Framework and Partial Mediation Model

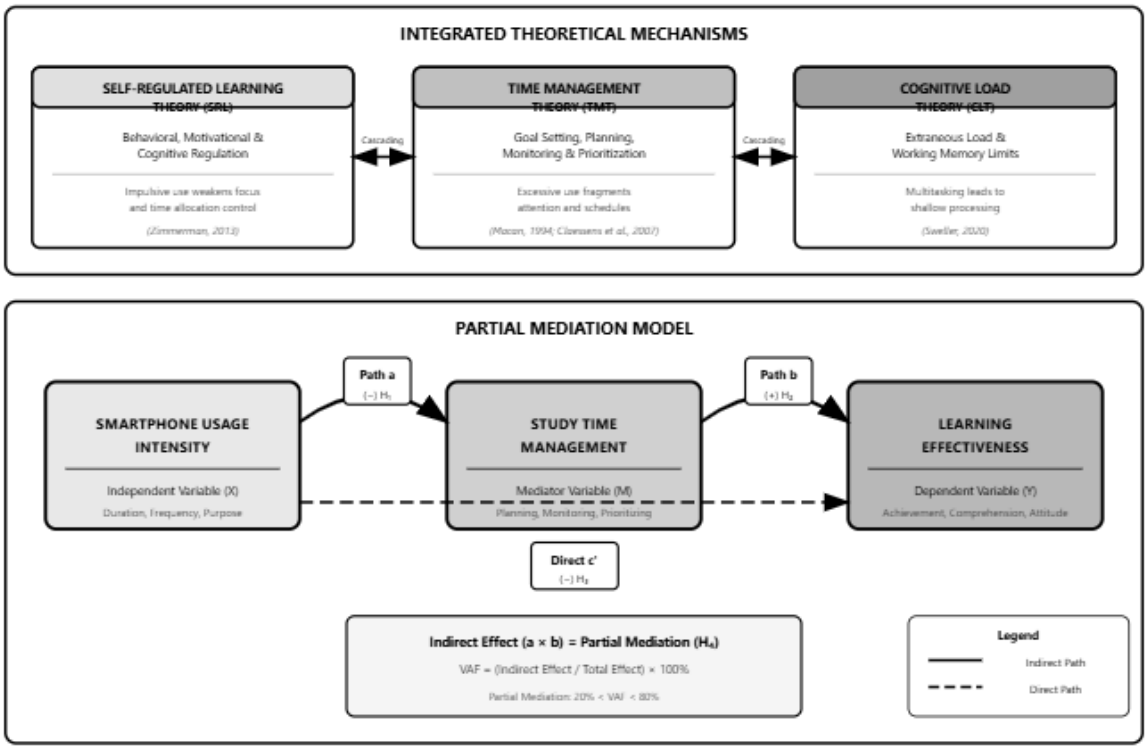

Figure 1. Integrated Theoretical Framework and Partial Mediation Model: Smartphone usage intensity triggers cascading disruptions across self-regulated learning, time management, and cognitive load dimensions, with study time management serving as the mediating pathway to learning effectiveness.

Empirical evidence indicates a substantial rise in smartphone usage intensity among adolescents globally and nationally. Average daily smartphone use among adolescents ranges between four to six hours, with a significant increase during the COVID-19 pandemic (WHO, 2021). In Indonesia, smartphone penetration reaches 79% of the population, placing the country among the highest globally (We Are Social, 2024). Reports from Kominfo (Informatika, 2023) and APJII (2022) reveal that Indonesian adolescents spend more than five hours per day on smartphones, with usage increasing by approximately 30% during the pandemic. Preliminary observations at Pelita Kasih High School in Bengkulu City indicate that nearly all students use smartphones for more than five hours daily, primarily for entertainment purposes. Such high-intensity usage raises concerns about reduced learning time and diminished learning effectiveness during a critical developmental phase of secondary education.

Despite growing research on smartphone usage and academic outcomes, significant gaps remain. Several studies have reported negative relationships between smartphone usage and academic performance without examining the underlying mechanisms that explain this relationship (Amez & Baert, 2020; Wang et al., 2023; Sari

et al., 2020). Most prior studies focus on direct effects and overlook the role of study time management as a mediating variable. Moreover, limited research has integrated smartphone usage intensity, study time management, and learning effectiveness within a comprehensive mediation framework, particularly in Indonesian high school contexts where unique cultural, technological, and educational factors may shape this relationship differently than in Western settings.

The Present investigation advances existing scholarship in three ways. First, by testing a partial mediation model that separates direct from indirect effects, the study clarifies the mechanistic role of time management in translating smartphone habits into academic consequences. Second, focusing on adolescent learners in Bengkulu City extends the geographic and cultural scope of prior research that has predominantly drawn from western populations. Third, quantifying mediation proportions through bootstrapped confidence intervals and the variance accounted for index provides school practitioners with empirically grounded benchmarks for policy development.

Theoretically, this research extends self-regulated learning theory by demonstrating how external technological factors interact with students' internal regulatory capacities to influence learning effectiveness. Practically, the findings provide evidence-based guidance for schools and policymakers in developing balanced smartphone usage policies that integrate digital literacy and time management training rather than relying solely on restrictive approaches.

Building on these considerations, the present study addresses five research questions: 1) What are the prevailing levels of smartphone usage intensity, study time management, and learning effectiveness among students at Pelita Kasih High School? 2) Does smartphone usage intensity significantly influence study time management? 3) Does smartphone usage intensity directly influence learning effectiveness? 4) Does study time management significantly influence learning effectiveness? 5) Does study time management mediate the influence of smartphone usage intensity on learning effectiveness?

Accordingly, the following hypotheses guide the empirical inquiry 1) H_1 : Smartphone usage intensity has a negative effect on study time management; 2) H_2 : Study time management has a positive effect on learning effectiveness; 3) H_3 :Smartphone usage intensity has a negative direct effect on learning effectiveness; 4) H_4 : Study time management significantly mediates the connection between the extent of smartphone use and its impact on learning outcomes.

B. Methods

This study employed a quantitative correlation with mediation analysis to examine the relationships among smartphone usage intensity, study time management and learning effectiveness among secondary school students. This study investigated the

mediating function of study time management explaining how smartphone habits impact academic achievement. Research was Conducted at SMA Pelita Kasih, a private Christian Secondary school in urban Bengkulu city, Indonesia. The school holds national "A" accreditation and serves students from diverse socioeconomic backgrounds. Smartphone ownership among students approaches 100%, consistent with national adolescent mobile penetration rates (APJII, 2022). All 75 students enrolled across grades X, XI dan XII during the 2025/2026 academic year participated through total sampling. Inclusion criteria required active enrollment, regular smartphone ownership and voluntary informed consent. All eligible students participated, yielding a 100% response rate.

Sample adequacy for PLS-SEM analysis was evaluated using established criteria. The "ten times rule" requires samples equal to ten times the maximum structural paths pointing to any construct (Hair et al., 2022). learning effectiveness receives two paths in this model, requiring minimum 20 cases, far exceeded by the current 75 participants. Regarding statistical power, Kock and Hadaya (2018) indicate that detecting medium effects ($f^2 = 0.15$) at 80% power requires approximately 55 participants for models with two predictors. Cohen (1992) recommends minimum 67 cases for similar conditions. The sample of 75 satisfies both benchmarks, ensuring adequate power for detecting meaningful relationships. Data were collected using 50 item questionnaires with four-point Likert scale (1=Strongly disagree to 4=strongly agree). this even numbered scale was selected to eliminate neutral responses and encourage definitive positions. Items were adapted from established theoretical framework and recent empirical studies. table 1 summarizes the dimensional structure, sources and sample items.

Table 1. Measurement Instruments, Dimensions and Sample Items

Construct	Dimensions	Items	Primary Sources	Sample Item
Smartphone Usage Intensity (X_1)	4	16	(Almakky, 2025; Amalina et al., 2024; Kushlev & Leitao, 2020; Marciano & Camerini, 2022; Przybylski & Weinstein, 2019; Sapci et al., 2021; Sari et al., 2020)	" I spend more time on smartphone than studying"
Study Time Management (X_2)	4	17	(Covey, 2016; Ding et al., 2024; Esan et al., 2025; Fu et al., 2025, 2025; Lee et al., 2022; Shakirova et al., 2022; Y. Wang et al., 2024; Wu et al., 2022; Britton & Tesser, 1991; Macan, 1994; Newport, 2019)	" I create organized daily and weekly study schedules"
Learning Effectiveness (Y)	3	17	(Anderson, 2002; Clemente-Suárez et al., 2024; Darling-Hammond et al., 2020; Hattie, 2023; Krathwohl, 2021; Lourenço & Paiva, 2024; Sweller, 2011; Syefrinando et al., 2022; J. C. Wang et al., 2023a; Zimmerman & Schunk, 2022)	" I can apply learning concepts to solve new problems"

Smartphone usage intensity (16 items) captured mobile device engagement through four dimensions; frequency of use (compulsive checking behaviors), duration of use (time spent during academic periods), time proportion (smartphone versus study allocation) and activity types (gaming and social media patterns). Study time management (17 items) assessed academic time regulation across four dimensions: schedule planning (timetable creation and goal setting), task prioritization (strategies ordering and distraction resistance), procrastination control (self-regulation and task imitation) and evaluation and adjustment. Learning effectiveness (17 items) operationalized learning success through three domains: cognitive (knowledge acquisition, application and critical thinking), affective (motivation, self-efficacy and persistence) and psychomotor (practical skills and adaptive learning). instrument validity was established through expert review and pilot testing with 30 senior high school students across Bengkulu city prior to data collection. Construct validity and reliability were assessed using PLS-SEM producers with result presented in table 2.

Table 2. Construct Reliability and Validity

Construct	Cronbach's α	Composite Reliability	AVE
Smartphone Usage Intensity	0.963	0.966	0.644
Study Time Management	0.966	0.970	0.650
Learning Effectiveness	0.976	0.978	0.721
Threshold	> 0.70	>0.70	> 0.50

All indicators' loadings from 0.756 to 0.878, exceeding the 0.70 threshold. Internal consistency was excellent with Cronbach's alpha between 0.963 and 0.976. AVE values confirmed convergent validity with all construct explaining over 50% indicator variance.

Table 3. Discriminant Validity (Furnell Larker Criterion)

Construct	SUI	STM	LE
Smartphone Usage Intensity	0.803		
Study Time Management	-0.587	0.806	
Learning Effectiveness	-0.534	0.712	0.849

Discriminant validity was confirmed as all AVE square roots exceeded inter construct correlations. HTMT ratios remained below 0.85 threshold (ranging 0.558 - 0.734) providing evidence that the three constructs represent empirically distinct phenomena. Analysis employed Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0, selected for its robustness with smaller samples and effectiveness with mediation models (Hair et al., 2022) following Anderson and

Gerbing's (1988) two stage approach, measurement model assessment preceded structural model evaluation. Patch coefficients were tested via bootstrapping (5.000 resamples) with effect size (f^2) and predictive relevance (Q^2) also computed. Mediation testing followed Hayes, (2018), examining indirect effects through bootstrapped 95% confidence intervals. Classification followed Zhao et al., (2010) criteria distinguishing partial, full, complementary and competitive mediation.

C. Results and Discussion

Table 4. Structural Equation Model Analysis Results

Hypothesis	Path	β	SE	t	p	f^2	Decision
H1	Smartphone → Time Management	-0.689	0.072	9.516	0.000	0.905	Supported
H2	Time Management → Learning Effectiveness	0.520	0.161	3.236	0.001	0.377	Supported
H3	Smartphone → Learning Effectiveness	-0.377	0.151	2.229	0.026	0.158	Supported
H4	Indirect Effect (X→M→Y)	-0.358	0.115	3.101	0.002	-	Supported

This study investigated whether study time management mediates the relationship between smartphone usage intensity and learning effectiveness among 75 secondary school students. The PLS-SEM analysis confirmed all hypothesized relationships: smartphone usage negatively predicted study time management ($\beta = -0.689$, $t = 9.516$, $p < 0.001$), time management positively predicted learning effectiveness ($\beta = 0.520$, $t = 3.236$, $p < 0.001$) and smartphone usage directly impaired learning outcomes ($\beta = -0.377$, $t = 2.229$, $p < 0.026$). The indirect effect through time management ($\beta = -0.358$, $t = 3.102$, $p < 0.002$) accounted for 51.51% of the total effect, confirming partial mediation wherein roughly half of smartphone's detrimental influence operates through disrupted temporal organization while the remainder functions through direct cognitive pathways. The complete model explained 62.4% variance in learning effectiveness, demonstrating substantial predictive capacity. Measurement quality met all established thresholds, with composite reliability exceeding 0.80 and average variance extracted surpassing 0.50 for all constructs, while discriminant validity satisfied booth Furnell larker and HTMT criteria.

Before interpreting these pathways theoretically, situating findings within sample context helps explain why observed relationships, while significant appear more moderate than studies examining clinical-level smartphone addiction. Descriptive analysis reveals a distinctive configuration among SMA Pelita Kasih students: moderate smartphone usage at 50.75% (M = 2.027), high time management at 75.75% (M = 3.031), and strong learning effectiveness at 78% (M = 3.125). This profile diverges

notably from research contexts recruiting participants with problematic or addictive usage patterns. Three contextual factors account for this divergence. The research site operates as a nationally accredited private Christian school serving families who maintain expectations regarding academic discipline, providing institutional scaffolding explicit behavioral standards, supervised study periods, and parental investment that constrains excessive usage absent from unstructured contexts. Students attending accredited institutions may also possess higher baseline self-regulatory capacities, representing a selected population whose pre-existing competencies buffer against smartphone's negative potential. Additionally, Indonesian secondary schools involve structured schedules and family monitoring patterns common throughout Asian educational systems that limit consequences emerging in less regulated environments.

This contextual understanding illuminates why several previous studies present contrasting perspectives. Purnama et al., (2024) documented positive mobile learning impacts, suggesting relationships depend substantially on usage purpose, when smartphones serve educational functions rather than entertainment, effects may differ considerably. Sakkopoulos et al., (2021) found smartphone-based response systems enhanced performance when purposefully integrated into classroom instruction, indicating that instructional design and structured protocols may moderate or reverse negative relationships observed in unstructured contexts. Mushtaq (2024) noted considerable individual variation, with some students demonstrating enhanced outcomes despite substantial engagement, suggesting self-regulatory capacity and digital literacy enable effective compensatory strategies among high-functioning individuals. These contrasts reinforce that smartphone-academic relationships are conditional rather than universal, depending on usage characteristics, individual differences, and contextual factors. The predominantly negative relationships observed in this study may reflect typical unstructured usage patterns among Indonesian adolescents rather than inherent technological properties. Notably, the coefficient linking smartphones to time management ($\beta = -0.689$) exceeds typical meta-analytic effect sizes, possibly reflecting the Indonesian context where smartphone adoption proliferated rapidly without concurrent digital literacy curriculum development.

These findings can be comprehensively understood through two interconnected theoretical frameworks. Self-regulated learning theory provides compelling explanatory architecture for why time management emerged as such a powerful mediator. According to this perspective, effective learning requires cyclical processes of forethought, performance monitoring, and self-reflection. Time management represents concrete behavioral manifestation of forethought processes, wherein students translate academic intentions into organized schedules and prioritized task sequences. When smartphones fragment attention and consume temporal resources, they disrupt precisely this translation from intention to organized action students may retain desire to study effectively while losing regulatory capacity to structure behavior

accordingly. This interpretation aligns with Zimmerman & Schunk (2022) who articulated that excessive digital engagement drains self-control resources necessary for alignment with learning goals. Sunday et al., (2021) provided empirical support demonstrating smartphone addiction compromises learning via attentional interference, while Chen & Lyu (2024) identified attention dysregulation as primary conduit linking excessive use to deteriorating time management. Y. Wang et al., (2024) uncovered bidirectional associations using cross-lagged methodology, confirming intensive usage erodes temporal organization while poor time management simultaneously heightens susceptibility to excessive use.

Cognitive load theory offers complementary insight into why smartphones directly impair learning beyond temporal displacement. Working memory possesses finite capacity allocated across competing demands, and smartphones impose extraneous load through notifications, multitasking temptations, and cognitive residue lingering after device interaction. Even when students technically have study time available, mental costs of recent smartphone engagement degrade learning quality. Upshaw et al., (2022) showed notifications create disruptions even when actively ignored, breaking deep focus needed for meaningful learning. Cilligol Karabey et al., (2024) documented how addiction affects adolescents across multiple dimensions disrupting sleep, increasing anxiety, and impairing concentration. From neuroplasticity standpoint, prolonged intensive engagement may reshape attention systems in ways undermining sustained academic focus. The significant direct effect retained after accounting for mediation (β = -0.377) confirms these immediate cognitive costs constitute meaningful secondary pathway. Conversely, effective time management reduces extraneous load by establishing predictable routines, freeing working memory for deeper content engagement. Trentepohl et al., (2022) documented that time management knowledge enhances performance through reduced cognitive strain, while Fu et al., (2025) confirmed time management significantly impacts study engagement predicting academic achievement.

The partial mediation structure, with time management accounting for 51.51% of total effect, carries important theoretical implications. P. S. Chen et al., (2021) documented time management's mediating role between mobile dependence and academic procrastination, while Liu et al., (2022) confirmed that time management and learning strategies jointly mediate smartphone addiction impacts. Jin et al., (2024) demonstrated time management's dual role as both vulnerable mechanism and protective factor, it represents pathway through which smartphones cause harm, yet strengthening it may buffer against negative effects. Tian et al., (2021) reinforced multi-pathway nature by confirming mobile addiction impacts achievement through both time mismanagement and cognitive interference. This dual-pathway understanding time displacement and direct cognitive costs, suggests interventions must address both mechanisms comprehensively.

These findings carry meaningful practical implications across multiple stakeholder

groups. Given time management mediated over half of smartphone's negative effects, interventions prioritizing temporal self-regulation represent particularly promising leverage points. Schools should incorporate structured time management curricula integrating planning tools, priority matrices, and schedule monitoring as explicit learning objectives rather than assuming students acquire these competencies independently. Digital wellness programs teaching intentional technology use recognizing devices as tools requiring strategic deployment rather than enemies requiring elimination would enhance metacognitive awareness regarding smartphone-time management connections. Environmental modifications such as phone-free study periods or designated device storage could provide structural support complementing skill development. For parents, these results suggest focusing exclusively on restricting access addresses only part of the challenge. Collaboratively establishing device-free study times rather than imposing unilateral restrictions, helping adolescents create realistic schedules acknowledging their desire for smartphone use, and monitoring homework completion as early indicators could prove more sustainable than adversarial approaches. Students themselves can recognize time displacement as primary risk pathway, implementing scheduling strategies like time-blocking to protect study periods and using built-in features strategically rather than viewing devices as purely problematic. Policymakers should consider integrating digital literacy and time management into national curriculum standards, providing teacher professional development on managing technology in classrooms, and developing balanced guidelines recognizing both risks and educational benefits.

Several limitations constrain conclusions and suggest future directions. Cross-sectional design precludes causal inference; longitudinal research is needed to establish whether smartphone usage temporally precedes time management disruption or whether students struggling with temporal organization turn to smartphones as escape. Single-school sampling from a private urban institution constrains generalizability to public schools, rural areas, and different socioeconomic contexts. Self-report measures introduce potential biases; future studies might incorporate objective screen time data alongside academic records. Additionally, measuring general usage intensity rather than distinguishing educational from recreational engagement potentially obscures heterogeneity. Intervention studies testing time management training as buffer against smartphone effects would provide practical validation of identified mechanisms.

D. Conclusions

This study demonstrates that smartphone usage intensity affects students' learning effectiveness through both direct and indirect pathways, confirming a partial mediation mechanism of study time management. The structural model shows that higher smartphone usage significantly weakens study time management, and stronger study time management significantly improves learning effectiveness;

moreover, smartphone usage also has a direct negative effect on learning effectiveness even after the mediator is included. These results indicate that the negative consequences of smartphone use are not only caused by reduced study time, but also by learning disruption such as distraction and decreased concentration, while time management remains a key self-regulatory skill that can buffer digital interference. Practically, schools should avoid prohibition-only policies and instead adopt integrated interventions: (1) establish clear, consistent rules for smartphone use during learning activities; (2) strengthen students' digital literacy so they can distinguish productive academic use from recreational overuse; and (3) implement structured time-management training (e.g., weekly planning, prioritization routines, time-blocking, and distraction-control strategies) supported by teachers and parents. Such a balanced approach is more likely to improve learning effectiveness because it targets both the behavioral route (time allocation) and the cognitive route (attention disruption) of smartphone impact. Future research should apply longitudinal or experimental designs to strengthen causal interpretation, use objective indicators of smartphone behavior (e.g., screen-time logs) to reduce self-report bias, and expand samples across different schools and regions to test whether cultural context, academic demands, and school policies moderate the strength of the direct and mediated effects.

E. Acknowledgement

The authors would like to express sincere gratitude to the principal and teachers of SMA Pelita Kasih, Bengkulu City, who facilitated data collection. Special appreciation is extended to all students who voluntarily participated in this study. Appreciation is also extended to colleagues and mentors for their constructive feedback during the research and writing process. Finally, the authors acknowledge the constructive feedback from anonymous reviewers that helped improve this manuscript.

References

Almakky, H. G. (2025). The Impact of Smartphone Usage on Academic Performance Among Students at King Abdulaziz University, Saudi Arabia: A Subgroup Analysis Based on Year of Study and Field of Specialization. *Journal of Ecohumanism*, *4*(1), 1483–1494. https://doi.org/10.62754/joe.v4i1.5952

Amalina, A., Samat, N., & Warmansyah, J. (2024). The Influence of Smartphone Usage Duration and Frequency on Smartphone Addiction in Early Childhood Using Binary Logistic Regression. *JOSTECH Journal of Science and Technology*, *4*(2), 167–176. https://doi.org/10.15548/jostech.v4i2.9768

Amez, S., & Baert, S. (2020). Smartphone use and academic performance: A literature review. *International Journal of Educational Research*, *103*, 101618. https://doi.org/10.1016/j.ijer.2020.101618

Anderson, L. W. (2002). This Issue. *Theory Into Practice*, *41*(4), 210–211. https://doi.org/10.1207/s15430421tip4104_1

APJII. (2022). Indonesia Internet Profile 2022. *SRA Consulting.*, *June*.

Britton, B. K., & Tesser, A. (1991). Effects of Time-Management Practices on College Grades. *Journal of Educational Psychology*, *83*(3), 405–410. https://doi.org/10.1037/0022-0663.83.3.405

Chen, G., & Lyu, C. (2024). The relationship between smartphone addiction and procrastination among students: A systematic review and meta-analysis. *Personality and Individual Differences*, *224*, 112652. https://doi.org/10.1016/j.paid.2024.112652

Chen, P. S., Li, J., & Kim, S. Y. (2021). Structural relationship among mobile phone dependence, self-efficacy, time management disposition, and academic procrastination in college students. *Iranian Journal of Public Health*, *50*(11), 2263–2273. https://doi.org/10.18502/ijph.v50i11.7582

Cilligol Karabey, S., Palanci, A., & Turan, Z. (2024). How does smartphone addiction affect the lives of adolescents socially and academically?: a systematic review study. *Psychology, Health & Medicine*, *29*(3), 631–654. https://doi.org/10.1080/13548506.2023.2229241

Claessens, B. J. C., Eerde, W. Van, Rutte, C. G., & Roe, R. A. (2007). A review of the time management literature. *Personnel Review*, *36*(2), 255–276. https://doi.org/10.1108/00483480710726136

Clemente-Suárez, V. J., Beltrán-Velasco, A. I., Herrero-Roldán, S., Rodriguez-Besteiro, S., Martínez-Guardado, I., Martín-Rodríguez, A., & Tornero-Aguilera, J. F. (2024). Digital Device Usage and Childhood Cognitive Development: Exploring Effects on Cognitive Abilities. *Children*, *11*(11), 1299. https://doi.org/10.3390/children11111299

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Covey, S. R. (2016). *The 7 Habits of Highly Effective People: Infographics Edition: Powerful Lessons in Personal Change* (Number 2018). Simon & Schuster. https://play.google.com/store/books/details?id=sm4TAgAAQBAJ

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

Ding, N., Shi, J., Xu, H., Wang, X., Liu, G., Mao, L., Zhang, G., & Zhang, J. (2024). The prospective associations among time management tendency, negative emotions, and problematic smartphone use in Chinese nursing students: enlightenment from COVID-19. *Frontiers in Public Health*, *12*. https://doi.org/10.3389/fpubh.2024.1323273

Esan, D. T., Olawade, D. B., Atule, I. F., Emetere, M., David-Olawade, A. C., Ramos, C. G., & Esan, T. O. (2025). The Impact of Smartphone Use on Learning Effectiveness: A Case Study of College Students. *The Open Public Health Journal*, *18*(1), 1–16. https://doi.org/10.2174/0118749445381116250318054244

Fu, Y., Wang, Q., Wang, X., Zhong, H., Chen, J., Fei, H., Yao, Y., Xiao, Y., Li, W., & Li, N. (2025). Unlocking academic success: the impact of time management on college

students' study engagement. *BMC Psychology*, *13*(1), 323. https://doi.org/10.1186/s40359-025-02619-x

Hair, J., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2022). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*.

Hattie, J. (2023). Visible Learning: The Sequel. In *Visible Learning: The Sequel*. Routledge. https://doi.org/10.4324/9781003380542

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: a regression-based approach / Andrew F. Hayes; series editor's note by Todd D. Little.* (Second Edition). The Guilford Press.

Informatika, K. K. dan. (2023). *Survey of ICT use and its implications for socio-cultural aspects of Indonesian society in 2023*. Kominfo RI.

Jin, Y., Zhou, W., Zhang, Y., Yang, Z., & Hussain, Z. (2024). Smartphone Distraction and Academic Anxiety: The Mediating Role of Academic Procrastination and the Moderating Role of Time Management Disposition. *Behavioral Sciences*, *14*(9). https://doi.org/10.3390/bs14090820

Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*, *28*(1), 227–261. https://doi.org/10.1111/isj.12131

Krathwohl, D. R. (2021). A Revision of Bloom's Taxonomy: An Overview. *Theory Into Practice*, *41*(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2

Kushlev, K., & Leitao, M. R. (2020). The effects of smartphones on well-being: theoretical integration and research agenda. *Current Opinion in Psychology*, *36*, 77–82. https://doi.org/10.1016/j.copsyc.2020.05.001

Lee, S. J., Choi, M. J., Yu, S. H., Kim, H. M., Park, S. J., & Choi, I. Y. (2022). Development and evaluation of smartphone usage management system for preventing problematic smartphone use. *Digital Health*, *8*. https://doi.org/10.1177/20552076221089095

Liu, F., Xu, Y., Yang, T., Li, Z., Dong, Y., Chen, L., & Sun, X. (2022). The Mediating Roles of Time Management and Learning Strategic Approach in the Relationship Between Smartphone Addiction and Academic Procrastination. *Psychology Research and Behavior Management*, *Volume 15*, 2639–2648. https://doi.org/10.2147/PRBM.S373095

Lourenço, A. A., & Paiva, M. O. A. (2024). Self-Regulation in Academic Success: Exploring the Impact of Volitional Control Strategies, Time Management Planning, and Procrastination. *International Journal of Changes in Education*, *1*(3), 113–122. https://doi.org/10.47852/bonviewIJCE42022392

Macan, T. H. (1994). Time Management: Test of a Process Model. *Journal of Applied Psychology*, *79*(3), 381–391. https://doi.org/10.1037/0021-9010.79.3.381

Marciano, L., & Camerini, A.-L. (2022). Duration, frequency, and time distortion: Which is the best predictor of problematic smartphone use in adolescents? A trace data study. *PLOS ONE*, *17*(2), e0263815. https://doi.org/10.1371/journal.pone.0263815

Matthay, M. A., Zemans, R. L., Zimmerman, G. A., & ... (2019). Acute respiratory distress syndrome. *Nature reviews Disease …*. https://www.nature.com/articles/s41572-019-0069-0

Mushtaq, I. (2024). The Impact of Smartphones on the Academic Performance of University Students. *Proceedings of The International Conference on Advanced Research in Education, Teaching, and Learning*, *1*(1), 13–25. https://doi.org/10.33422/aretl.v1i1.188

Newport, C. (2019). *Digital Minimalism by Cal Newport*.

Przybylski, A. K., & Weinstein, N. (2019). Digital Screen Time Limits and Young Children's Psychological Well-Being: Evidence from a Population-Based Study. *Child Development*, *90*(1), e56–e65. https://doi.org/10.1111/cdev.13007

Purnama, Y., Lewa, I., J, S. W., S, F. A., & Wahyuni, S. N. (2024). Mobile Learning Revolution: Harnessing the Potential of Smartphones in the Learning Process. *Journal International of Lingua and Technology*, *3*(2), 313–328. https://doi.org/10.55849/jiltech.v3i2.683

Sakkopoulos, E., Krasadakis, P., Tsoni, R., & Verykios, V. S. (2021). Dynamic Mobile Student Response System. *Advances in Intelligent Systems and Computing*, *1192 AISC*, 276–288. https://doi.org/10.1007/978-3-030-49932-7_27

Sapci, O., Elhai, J. D., Amialchuk, A., & Montag, C. (2021). The relationship between smartphone use and students` academic performance. *Learning and Individual Differences*, *89*, 102035. https://doi.org/10.1016/j.lindif.2021.102035

Sari, A. I., Suryani, N., Rochsantiningsih, D., & Suharno, S. (2020). Digital learning, smartphone usage, and digital culture in indonesia education. *Integration of Education*, *24*(1), 20–31. https://doi.org/10.15507/1991-9468.098.024.202001.020-031

Schunk, D. H., & Zimmerman, B. J. (2012). *Motivation and self-regulated learning: Theory, research, and applications*. books.google.com.

Shakirova, D. M., Podyganova, K. E., Dyatlova, D. V., & Savelyeva, D. S. (2022). TIME Management as A Tool for Planning Activities. *Krasnoyarsk Science*, *11*(1), 40–52. https://doi.org/10.12731/2070-7568-2022-11-1-40-52

Sunday, O. J., Adesope, O. O., & Maarhuis, P. L. (2021). The effects of smartphone addiction on learning: A meta-analysis. *Computers in Human Behavior Reports*, *4*, 100114. https://doi.org/10.1016/j.chbr.2021.100114

Sweller, J. (2011). *CHAPTER TWO - Cognitive Load Theory* (J. P. Mestre & B. H. B. T.-P. of L. and M. Ross (ed.); Vol. 55, hal. 37–76). Academic Press. https://doi.org/10.1016/B978-0-12-387691-1.00002-8

Sweller, J. (2020). Cognitive load theory and educational technology. *Educational Technology Research and Development*, *68*(1), 1–16. https://doi.org/10.1007/s11423-019-09701-3

Syefrinando, B., Sukarno, Ariawijaya, M., & Nasukha, A. (2022). the Effect of Digital Literacy Capabilities and Self-Regulation on the Student's Creativity in Online Physics Teaching. *Jurnal Pendidikan IPA Indonesia*, *11*(3), 489–499. https://doi.org/10.15294/jpii.v11i3.31811

Tian, J., Zhao, J., Xu, J., Li, Q., Sun, T., Zhao, C., Gao, R., Zhu, L., Guo, H., Yang, L., Cao, D., & Zhang, S. (2021). Mobile Phone Addiction and Academic Procrastination Negatively Impact Academic Achievement Among Chinese Medical Students. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.758303

Trentepohl, S., Waldeyer, J., Fleischer, J., Roelle, J., Leutner, D., & Wirth, J. (2022). How Did It Get So Late So Soon? The Effects of Time Management Knowledge and Practice on Students' Time Management Skills and Academic Performance. *Sustainability*, *14*(9), 5097. https://doi.org/10.3390/su14095097

Upshaw, J. D., Stevens, C. E. J., Ganis, G., & Zabelina, D. L. (2022). The hidden cost of a smartphone: The effects of smartphone notifications on cognitive control from a behavioral and electrophysiological perspective. *PloS One*, *17*(11), e0277220. https://doi.org/10.1371/journal.pone.0277220

Wang, J. C., Hsieh, C.-Y., & Kung, S.-H. (2023a). The impact of smartphone use on learning effectiveness: A case study of primary school students. *Education and Information Technologies*, *28*(6), 6287–6320. https://doi.org/10.1007/s10639-022-11430-9

Wang, J. C., Hsieh, C. Y., & Kung, S. H. (2023b). The impact of smartphone use on learning effectiveness: A case study of primary school students. *Education and Information Technologies*, *28*(6), 6287–6320. https://doi.org/10.1007/s10639-022-11430-9

Wang, Y., Lu, Y., Tian, X., Liu, Y., & Ma, W. (2024). The relationship between mobile phone addiction and time management disposition among Chinese college students: A cross-lagged panel model. *Heliyon*, *10*(3), e25060. https://doi.org/10.1016/j.heliyon.2024.e25060

We Are Social. (2024). *Digital 2024: Indonesia*. https://datareportal.com/reports/digital-2024-indonesia

WHO. (2021). *Adolescent screen time during COVID-19 pandemic*. https://www.who.int/publications

Wu, M., Yang, J., Yuan, Y., & Zhang, Y. (2022). College Students' Time Management Disposition, Self-Esteem and Mobile Phone Addiction. *International Journal of Physical Activity and Health*. https://doi.org/10.18122/ijpah.1.2.10.boisestate

Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis. *Journal of Consumer Research*, *37*(2), 197–206. https://doi.org/10.1086/651257

Zimmerman, B. J., & Schunk, D. H. (2022). Self-regulation of Learning and Performance. In *Self-Regulation of Learning and Performance Issues and Educational Applications*. Routledge. https://doi.org/10.4324/9780203763353