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Digital distraction or digital learning? smartphone use patterns and academic outcomes among students in Nigerian public secondary schools

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Abstract
The rapid proliferation of smartphones among secondary school students has transformed the contemporary learning environment, creating opportunities for digital learning while simultaneously raising concerns about digital distraction and its implications for students' academic performance. This study investigated smartphone use patterns and academic outcomes among students in Nigerian public secondary schools, focusing specifically on educational smartphone use, recreational use, screen time, classroom phone use, attention, self-regulated learning, and differences associated with school location. A quantitative cross-sectional research design was adopted. The study comprised 900 senior secondary school students drawn from nine Nigerian public secondary schools, including four urban and five rural schools. The sample consisted of 450 students from urban schools and 450 from rural schools, with equal representation of 300 students each from SS1, SS2, and SS3. Validated measures of educational smartphone use, recreational smartphone use, classroom phone use, attention, and self-regulated learning demonstrated satisfactory reliability, with Cronbach's alpha coefficients ranging from .84 to .91. Findings revealed a significant positive relationship between educational smartphone use and academic outcomes ($r = .41$, $p < .001$), suggesting that purposeful academic engagement with smartphones was associated with improved achievement. In contrast, recreational smartphone use showed a significant negative relationship with academic outcomes ($r = -.38$, $p < .001$). Phone use during classroom instruction was also negatively associated with students' attention levels ($r = -.29$). Furthermore, moderation analysis indicated that the negative effect of recreational smartphone use was approximately 1.7 times stronger among students in rural schools, with a significant interaction effect (beta = -.22, $p < .001$). The regression model incorporating prior academic performance, educational smartphone use, and recreational smartphone use explained 52% of the variance in academic outcomes ($R^2 = .52$). The study concludes that the educational consequences of smartphone use depend substantially on the purpose, intensity, context, and regulation of use rather than smartphone access alone. Nigerian public secondary schools should therefore promote purposeful digital learning, strengthen students' digital self-regulation, regulate distracting smartphone use during instruction, and improve digital learning resources, particularly in rural schools.

Keywords: Academic outcomes, digital distraction, digital learning, educational technology, public secondary schools, smartphone use, Nigeria

Introduction

Digital technologies have become deeply embedded in the educational, social, and recreational lives of contemporary adolescents. Among these technologies, the smartphone has emerged as perhaps the most accessible and frequently used digital device because it combines internet connectivity, communication, multimedia, social networking, gaming, information retrieval, and educational applications within a portable platform. For secondary school students, smartphones can provide immediate access to electronic textbooks, instructional videos, educational applications, online libraries, search engines, collaborative learning platforms, artificial intelligence-supported learning tools, and communication channels with teachers and peers. At the same time, the same device provides uninterrupted access to social media, online games, entertainment videos, instant messaging, and other activities capable of diverting students' attention from academic tasks. Consequently, the educational significance of smartphones is increasingly defined by a fundamental paradox: smartphones can function as powerful instruments for digital learning, but they can equally become significant sources of digital distraction.

The global expansion of digital technology has transformed debates about educational technology from questions of simple access to more complex questions concerning the quality, purpose, duration, and context of digital engagement. Evidence increasingly suggests that access to technology alone does not automatically produce improved educational outcomes. Rather, what students do with digital devices appears to be more consequential than mere ownership or frequency of access. Wang *et al.* (2024) [12], in a meta-analysis of 48 empirical studies examining digital device use and adolescent academic performance, found that educational use was positively associated with academic performance, whereas entertainment, social networking, gaming, and longer durations of device use were negatively associated with achievement. This distinction challenges both technologically deterministic assumptions that smartphones necessarily enhance education and restrictive perspectives that regard smartphones primarily as educational threats.

The educational potential of smartphones is considerable. Students can use smartphones to search for information, download learning materials, participate in virtual discussions, watch instructional videos, communicate about assignments, access learning management systems, practise examination questions, and engage in self-directed learning. Smartphones can therefore extend learning beyond the temporal and physical boundaries of conventional classrooms. This flexibility may be especially relevant in educational systems where schools have limited libraries, computer laboratories, textbooks, and other instructional resources. When intentionally incorporated into teaching and learning, digital technologies can facilitate access to information and support more flexible learning experiences. OECD (2024a) similarly observed that intentional integration of digital technology into education can be positively associated with student performance, while recreational digital-device use at school tends to show the opposite relationship.

The educational value of smartphone access, however, coexists with a growing problem of digital distraction. Digital distraction refers broadly to interruptions of learners' concentration and engagement in academic activities caused by digital technologies or digitally mediated stimuli. Martin *et al*. (2025) [5], in a systematic review of digital distraction in education, identified technology-related distractors, personal needs, and features of instructional environments as major sources of distraction. Their review further indicated that the consequences extend beyond immediate attention loss to problems involving learner performance and classroom instruction. In smartphone-mediated environments, distraction may occur through notifications, messaging, social-media feeds, short-form videos, games, internet browsing, or habitual checking behaviours.

This issue is particularly significant during classroom instruction. Learning requires sustained attention, cognitive engagement, information processing, and the integration of new knowledge with existing knowledge. When a student repeatedly shifts attention between a lesson and smartphone notifications, messages, social-media posts, or entertainment content, cognitive resources that should be allocated to the learning task may become fragmented. The Organisation for Economic Co-operation and Development reported from PISA 2022 [6] evidence that approximately 30% of students across OECD countries indicated that they became distracted by digital devices in most or every mathematics lesson. Students reporting such frequent distraction scored approximately 15 points lower in mathematics than students who reported that distraction almost never occurred, after adjustment for socioeconomic characteristics of students and schools (OECD, 2023).

More recent OECD analysis reinforces the distinction between productive and recreational screen engagement. OECD (2024b) reported that about three-quarters of students in OECD countries spent more than one hour per weekday browsing social networks and that almost one-third experienced distraction from digital-device use during class. The organisation consequently emphasised the importance of strengthening students' digital competencies and behaviours rather than treating technology access itself as an educational outcome. These findings highlight the importance of differentiating educational screen time from recreational screen time.

Empirical literature increasingly supports this distinction. Paterna *et al*. (2024) [10], through a systematic review and meta-analysis of problematic smartphone use and academic achievement, demonstrated that problematic smartphone behaviours constitute an important educational concern rather than simply a lifestyle issue. Kuş (2025) [11], in a meta-analysis covering 63 studies and more than 124,000 participants across 28 countries, similarly examined how smartphone addiction, social-media use, video gaming, and related technology factors interact with academic performance. Such evidence demonstrates that digital behaviours have become relevant explanatory variables in understanding contemporary student achievement.

Recent systematic evidence focusing specifically on school-age children and adolescents further strengthens this position. Pyhältö *et al*. (2025) [11] reviewed 34 studies published between 2013 and June 2025 [11] concerning off-task smartphone and social-media use among children and adolescents aged 7-18 years. Most of the identified relationships between off-task use and academic achievement were negative, while problematic smartphone and social-media behaviours were particularly consistently associated with poorer achievement. Thus, the emerging evidence suggests that the critical question is no longer simply whether students use smartphones, but how, why, when, and under what conditions they use them.

This distinction has considerable relevance to Nigerian secondary education. Nigeria has experienced rapid growth in internet-enabled mobile communication, and smartphones have increasingly become important means through which young people communicate, consume information, interact socially, and access educational materials. For many students, particularly where personal computers and institutional digital facilities are limited, the smartphone may constitute their most readily available gateway to digital information. This creates significant opportunities for mobile learning, but it also increases exposure to social networking, gaming, online entertainment, instant messaging, and other competing activities.

Evidence from Nigerian schools already points to this tension. Atomatofa *et al*. (2024) [1], examining social-media usage among secondary school science students in public and private schools in Delta State, drew attention to the substantial time students with smartphone access may devote to social networking and the potential implications for study and achievement. However, treating all smartphone or social-media engagement as a single phenomenon risks obscuring substantial differences between students who use smartphones to access notes, educational YouTube content, assignments and class discussions and those whose use is dominated by entertainment, social networking, gaming and non-academic communication.

The problem may be more complex in Nigerian public secondary schools because of differences in school resources and socioeconomic conditions. Urban schools frequently have relatively greater access to electricity, internet connectivity, digital facilities, qualified personnel and supplementary learning opportunities than schools in disadvantaged rural communities. Smartphones may therefore play a compensatory educational role for students attending resource-constrained schools by providing access to materials that would otherwise be unavailable. Conversely, weak institutional resources, limited digital

supervision, high data costs, inadequate digital literacy and poor connectivity may make it difficult for students to convert smartphone access into meaningful academic learning.

Socioeconomic status may further shape these relationships. Students from higher socioeconomic backgrounds may have more reliable internet access, greater parental educational support, better learning environments, and additional digital devices, while students from low-income households may depend primarily on smartphones for both educational and recreational internet access. Likewise, school-resource disparities may moderate the extent to which students can transform personal technology into academic capital. The same smartphone could therefore function as a learning resource in one educational context and predominantly as an entertainment device in another.

Another important mechanism linking smartphone behaviour with academic outcomes is self-regulated learning. Digital learning environments require students to exercise considerable autonomy in deciding what content to access, how long to remain engaged, when to ignore notifications, and how to balance educational and recreational activities. Students with stronger self-regulation may deliberately use smartphones for assignments, research, instructional videos and revision while limiting distracting applications during study. Students with weaker self-regulatory capacity may struggle to resist the immediate rewards associated with entertainment and social communication.

Attention is similarly central to the smartphone-learning relationship. The architecture of many contemporary applications encourages repeated engagement through notifications, personalised content, social feedback and continuously refreshed information. During classroom lessons, even short interruptions can shift attention away from instructional content. OECD (2023) indicates that students who frequently use smartphones at school are more likely to report distraction and that students are less distracted when they disable social-network notifications and reduce pressure to respond to messages during class.

These concerns have generated debates about banning smartphones in schools. Although restrictions may reduce opportunities for off-task behaviour, evidence suggests that prohibition alone is unlikely to resolve the problem. More fundamentally, complete prohibition may remove opportunities to teach students how to use technologies responsibly and may be difficult to justify in contexts where smartphones provide an affordable route to digital learning resources. The more sustainable policy challenge may therefore involve establishing structured rules for classroom use, developing digital literacy and self-regulation, strengthening teacher capacity for technology-supported instruction, and clearly differentiating legitimate educational use from recreational distraction.

Against this background, there remains a need for context-specific empirical evidence from Nigerian public secondary schools that simultaneously examines the beneficial and detrimental dimensions of smartphone use. Much of the discourse surrounding young people's smartphone use concentrates either on its educational benefits or on risks such as addiction, excessive social-media use and distraction. Such binary approaches provide an incomplete account because educational and recreational uses can coexist within the same student and device. Furthermore, examining overall screen time without considering purpose may conceal important relationships.

The present study therefore investigates digital distraction or digital learning: smartphone use patterns and academic outcomes among students in Nigerian public secondary schools. It examines educational smartphone use, recreational smartphone use, daily screen time and phone use during classroom instruction in relation to academic achievement, attention and self-regulated learning. The study additionally considers prior academic performance, socioeconomic status, school resources and urban-rural location as important contextual factors. Particular attention is given to whether school location moderates the negative relationship between recreational smartphone use and academic outcomes.

By examining a sample of 900 senior secondary school students across nine Nigerian public secondary schools, the study seeks to move the debate beyond the simplistic question of whether smartphones are 'good' or 'bad' for students. Instead, it conceptualises smartphone effects as conditional upon purpose, intensity, timing, behavioural regulation and educational context. Such an approach is consistent with contemporary international evidence demonstrating that purposeful educational technology use can support achievement while excessive or off-task recreational use can undermine attention and learning (OECD, 2024a; Pyhältö *et al*., 2025; Wang *et al*., 2024) [11, 12].

Review of Related Literature

Conceptualising Smartphone Use in Secondary Education

The rapid diffusion of smartphones has significantly altered the learning environment of adolescents. Contemporary smartphones integrate internet access, social networking, multimedia, artificial intelligence applications, educational platforms, video streaming, gaming, digital libraries, and communication tools within a single portable device. This multifunctionality makes the smartphone simultaneously an educational resource and a potential source of distraction. Contemporary scholarship has therefore increasingly moved away from treating smartphone use as a single behaviour towards examining the purpose, intensity, timing, location, and context of use.

Wang *et al*. (2024) [12] demonstrated the importance of this distinction in a meta-analysis of 48 empirical studies on digital-device use and adolescent academic performance. Although overall digital-device use showed a positive association with academic performance, educational use was positively related to achievement, whereas entertainment/social use and gaming were negatively associated with academic performance. Longer duration of digital-device use was also associated with poorer academic outcomes. For the present study, smartphone use is conceptualised along four major dimensions: educational use, recreational use, screen time, and phone use during classroom instruction.

Smartphone Use for Digital Learning

Digital learning refers to learning experiences facilitated or enhanced through digital technologies. Smartphones have expanded opportunities for digital learning because students can obtain educational information irrespective of time and

location. A student who encounters difficulty with a mathematical concept can access instructional videos, worked examples, interactive exercises, online tutorials, or peer-support groups through a smartphone. Such access can complement classroom instruction and encourage learner autonomy.

Smartphone-supported learning may be especially important in educational environments characterised by shortages of textbooks, libraries, computer laboratories, and other instructional resources. Wang *et al*. (2024) [12] found that digital-device use specifically for educational purposes was positively correlated with academic performance, while recreational uses showed the opposite pattern. Caballero-Julia *et al*. (2024) [2], reviewing the relationship between screen use and educational outcomes in childhood, similarly emphasised that digital technology creates both benefits and risks and that educational outcomes depend substantially on patterns and contexts of use.

Recreational Smartphone Use and Digital Distraction

Digital distraction represents one of the principal concerns surrounding smartphone use among students. Martin *et al*. (2025) [5] describe digital distraction in educational settings in terms of interruptions to learners' concentration during academic activities resulting from engagement with digital technologies. Their systematic review classified major causes into technology-related distractors, personal needs, and instructional-environment factors. Technology-related distractors constituted the largest category, while consequences included impaired personal performance, ineffective classroom instruction, and problematic technology use.

Recent systematic evidence indicates that off-task smartphone behaviour is predominantly negatively related to academic achievement. Pyhältö *et al*. (2025) [11] reviewed 34 studies involving children and adolescents aged 7-18 years and concluded that the relationships between off-task smartphone/social-media use and academic achievement were negative in most of the studies examined. Paterna *et al*. (2024) [10] similarly provided cumulative evidence that problematic smartphone behaviour is an educationally relevant factor associated with academic achievement. Recreational use should not necessarily be regarded as harmful in itself; the educational concern arises when it becomes excessive, compulsive, poorly regulated or occurs during periods that should be dedicated to learning.

Screen Time and Academic Outcomes

Screen time represents another important dimension of smartphone behaviour. Students who spend extended periods using smartphones may have less time available for homework, independent reading, sleep, physical activities and interpersonal interaction. Excessive screen exposure can therefore influence academic achievement indirectly through time displacement. The relationship is nevertheless complex because total duration does not identify the purpose of use.

Wang *et al*. (2024) [12] found that longer durations of digital-device use were associated with lower academic performance, but purpose mattered substantially: educational use was positively associated with performance, whereas entertainment/socialising and gaming were negatively associated with achievement. This provides an important justification for examining screen time alongside educational and recreational use rather than interpreting screen duration independently.

Classroom Smartphone Use, Attention and Multitasking

Attention is fundamental to successful learning because students must selectively process relevant information while suppressing competing stimuli. Smartphone use during classroom instruction may disrupt this process. Notifications, messages and social-media updates can redirect attention away from instructional material, while even self-initiated checking can interrupt cognitive processing. Martin *et al*. (2025) [5] identified inability to maintain sustained attention, multitasking, poorer cognitive processing and comprehension, reduced recall, less accurate note-taking, procrastination and lower academic performance among consequences of digital distraction.

The mechanism underlying this effect is frequently described as media multitasking. Students may believe that they can simultaneously follow a lesson, exchange messages, check social media and retain instructional information. Cognitive research indicates that many forms of apparent multitasking actually involve rapid task switching. Chen *et al*. (2025) [3], in a meta-analysis of 27 experiments, found a negative medium-sized effect of mobile-phone distraction on learning memory. Classroom phone use may also create externalities because one student's behaviour can distract surrounding classmates.

Smartphone Use and Self-Regulated Learning

Self-regulated learning refers to learners' capacity to plan, monitor and regulate their cognition, motivation, behaviour and learning strategies in pursuit of academic goals. The concept is particularly important in digital environments because smartphones provide students with considerable freedom to determine what they access and how long they remain engaged. Students with strong self-regulatory abilities may establish study objectives, silence notifications, avoid entertainment applications during academic periods, organise electronic learning resources, monitor progress and terminate recreational activities when necessary.

Digital distraction can therefore be interpreted partly as a failure of attentional and behavioural self-regulation. Martin *et al*. (2025) [5] found that the causes of digital distraction extend beyond technological features to personal needs and environmental conditions. The relationship may also be reciprocal: poor self-regulation can encourage problematic smartphone behaviour, while repeated exposure to highly stimulating digital environments may make sustained engagement with less immediately rewarding academic tasks increasingly difficult.

Theoretical Framework

The study is anchored principally in Self-Regulated Learning Theory and a cognitive-load perspective. Self-Regulated Learning Theory explains how students actively control their learning through goal setting, strategic planning, self-monitoring, attention management and evaluation of outcomes. From this perspective, smartphones provide resources whose educational consequences depend substantially on learners' ability to regulate their behaviour.

The cognitive-load perspective provides a complementary explanation. Human working memory has limited

processing capacity. Learning becomes less efficient when cognitive resources are unnecessarily consumed by competing stimuli. When students divide attention between classroom instruction and smartphone messages, videos, games or social-media content, extraneous cognitive demands may increase. Chen *et al*. (2025) and Martin *et al*. (2025) [3, 5] provide empirical support for the proposition that phone-related distraction can undermine attention, comprehension and recall.

School Location, Resources and Digital Inequality

The relationship between smartphone use and academic achievement does not occur independently of students' educational environments. Differences between urban and rural schools may affect internet connectivity, availability of electricity, digital infrastructure, teacher competence, parental support and access to alternative educational resources. Contemporary digital inequality therefore extends beyond whether an individual owns a device to include differences in connectivity, skills, purposes of use, quality of digital engagement and benefits obtained from technology.

This argument has particular relevance to Nigerian public secondary schools. Students in well-resourced urban schools may combine smartphones with libraries, textbooks, computers, reliable internet and teacher-supported digital resources. Students in rural schools may rely much more heavily on smartphones as their primary digital device while experiencing weaker connectivity and fewer complementary educational resources. School-resource availability is therefore incorporated into the present study as an important contextual variable.

Empirical Evidence from Nigeria

Nigerian research increasingly recognises the influence of mobile technologies and social media on students' educational experiences. Atomatofa *et al*. (2024) [12], for example, investigated social-media usage among junior secondary school science students in public and private schools in Delta State who had access to Android smartphones. The study highlighted concerns that extensive social-networking engagement may reduce time devoted to study.

The Nigerian evidence is important because patterns identified internationally cannot automatically be generalised to Nigerian public secondary schools. Differences in infrastructure, household socioeconomic conditions, educational resources, internet affordability, school policies and digital literacy may modify the relationship between smartphone use and achievement. Existing Nigerian studies frequently concentrate on social-media use, smartphone addiction, general internet usage or student perceptions, while fewer simultaneously distinguish educational and recreational use and incorporate attention, self-regulation, prior achievement and urban-rural differences.

Synthesis of Literature and Research Gap

The literature reveals a consistent but nuanced pattern. Smartphones possess genuine educational potential because they expand access to learning resources and support flexible, collaborative and self-directed learning. At the same time, recreational, problematic and off-task smartphone behaviours are generally associated with poorer academic outcomes. Classroom smartphone use can impair sustained attention, increase multitasking and interfere with memory and information processing (Chen *et al*., 2025; Martin *et al*., 2025) [3, 5].

Significant contextual and methodological gaps remain, particularly in Nigerian secondary education. Existing research has not sufficiently integrated different patterns of smartphone use with academic achievement, attention, self-regulated learning and contextual inequalities within a single analytical framework. The present study addresses these gaps by examining 900 students from nine Nigerian public secondary schools, distinguishing educational use, recreational use, screen time and classroom use, and investigating whether school location moderates the relationship between recreational smartphone use and academic performance.

Methodology

Research Design

The study adopted a quantitative cross-sectional correlational research design to investigate smartphone use patterns and academic outcomes among students in Nigerian public secondary schools. The design was appropriate because the study sought to determine the nature and magnitude of relationships among educational smartphone use, recreational smartphone use, screen time, phone use during classroom instruction, attention, self-regulated learning, and academic performance without manipulating the independent variables.

Population, Sample and Sampling Procedure

The analytical sample consisted of 900 senior secondary school students drawn from nine public secondary schools, comprising four urban and five rural schools. The sample was equally distributed between urban schools (n = 450; 50.0%) and rural schools (n = 450; 50.0%). Gender distribution comprised 452 females (50.2%) and 448 males (49.8%). Students from SS1, SS2 and SS3 were equally represented, with 300 students in each class. Socioeconomic status comprised 310 low-SES, 320 middle-SES and 270 high-SES students. A multistage sampling framework was used, beginning with stratification by location and class level and followed by student selection within participating schools.

Instrumentation and Measurement of Variables

Data were collected using a structured Smartphone Use Patterns and Learning Outcomes Questionnaire (SUPLOQ) together with students' academic-performance records. Educational Smartphone Use was measured with five items covering academic notes, educational YouTube content, learning applications, class WhatsApp groups and assignments (alpha = .89; M = 3.12). Recreational Smartphone Use was measured with five items covering social media, gaming, non-academic chatting and entertainment-oriented YouTube use (alpha = .91; M = 3.68). Daily screen time ranged from 0.5 to 12 hours, with a mean of 5.4 hours. Phone Use During Class was assessed with three items (alpha = .84). The School Resource Index ranged from 1 to 5 and averaged 2.3 in rural schools and 3.6 in urban schools.

Measurement of Academic and Learning Outcomes

The principal dependent variable was Academic Outcome Total, computed as the average of current Mathematics, English Language and Civic Education scores on a 0-100 scale. Prior Academic Score, obtained from the previous-term average, served as a baseline control (M = 48.7, SD = 16.2). A Gain Score was calculated as current academic outcome minus prior score. Attention Level was assessed with six items (alpha = .86), while Self-Regulated Learning was measured with eight items (alpha = .88). A Use-Type Ratio was computed by dividing educational use by recreational use. High Distraction was coded when recreational use exceeded 4.0 and classroom phone use also exceeded 4.0.

Validity and Reliability

Content and face validity were established through expert review in educational technology, counselling, educational management, measurement and evaluation. Items were assessed for relevance, clarity and appropriateness. Internal consistency was evaluated using Cronbach's alpha coefficients, which ranged from .84 to .91 and therefore exceeded the commonly accepted .70 threshold.

Data Collection Procedure and Ethical Considerations

Permission was obtained from relevant school authorities before data collection. Participants were informed of the purpose of the study and assured that participation was voluntary. Confidentiality and anonymity were maintained through numerical student identification codes. Appropriate school and parental or guardian consent procedures and student assent were observed, and academic records were used solely for research purposes.

Method of Data Analysis

Data were analysed using descriptive and inferential statistical procedures. Frequencies, percentages, means and standard deviations summarised demographic characteristics and study variables. Pearson product-moment correlations determined bivariate relationships. Hierarchical multiple regression examined the predictive contributions of prior academic achievement, educational smartphone use, recreational smartphone use and relevant controls. Moderation analysis used interaction terms, particularly Recreational Use x Location, to determine whether the relationship between recreational use and academic outcomes differed between urban and rural students. Statistical significance was evaluated at the .05 alpha level, with $p < .001$ reported where applicable.

Results and Discussion

Results

Table 1: Demographic and Contextual Characteristics of Respondents (N=900)

Variable	Category	Frequency	Percentage
Location	Rural	450	50.0
	Urban	450	50.0
Gender	Female	452	50.2
	Male	448	49.8
Class level	SS1	300	33.3
	SS2	300	33.3
	SS3	300	33.3
Socioeconomic status	Low	310	34.4
	Middle	320	35.6
	High	270	30.0

Table 1 indicates balanced representation across major demographic and educational categories. Rural and urban students were equally represented, the gender distribution was approximately equal, and each senior secondary class contributed one-third of the sample.

Table 2: Descriptive Statistics for Major Study Variables

Variable	Scale/Range	Mean	Reliability/SD
Educational smartphone use	1-5	3.12	alpha = .89
Recreational smartphone use	1-5	3.68	alpha = .91
Daily screen time	0.5-12 hours	5.40 hrs	-
Phone use during class	1-5	-	alpha = .84
Attention level	1-5	-	alpha = .86
Self-regulated learning	1-5	-	alpha = .88
Prior academic score	0-100	48.70	SD = 16.20
School resource index: Rural	1-5	2.30	-
School resource index: Urban	1-5	3.60	-

Students reported greater recreational smartphone use (M = 3.68) than educational use (M = 3.12), while average daily screen time was 5.4 hours. Rural schools recorded a lower mean resource index (2.30) than urban schools (3.60). All multi-item measures demonstrated satisfactory internal consistency.

Table 3: Selected Correlations Between Smartphone-Use Patterns and Student Outcomes

Relationship	r	Direction	p-value
Educational use - Academic outcome	.41	Positive	< .001
Recreational use - Academic outcome	-.38	Negative	< .001
Phone use during class - Attention level	-.29	Negative	< .001*

Educational smartphone use demonstrated a moderate positive relationship with academic outcome ($r = .41$, $p < .001$), whereas recreational smartphone use had a moderate negative relationship with academic outcome ($r = -.38$, $p < .001$). Phone use during classroom instruction was negatively related to attention ($r = -.29$).

Table 4: Summary of Regression Model Predicting Academic Outcomes

Model Indicator	Result
Key predictors	Prior score, educational use, recreational use
R^2	.52
Variance explained	52.0%
Unexplained variance	48.0%
Overall interpretation	Substantial explanatory power

The regression model incorporating prior academic score, educational smartphone use, and recreational smartphone use accounted for 52% of the variance in students' academic outcomes ($R^2 = .52$), indicating substantial explanatory power for an educational-behavioural model.

Table 5: Moderating Effect of School Location on Recreational Smartphone Use and Academic Outcome

Moderation Indicator	Result
Interaction	Recreational Use x Location
Standardised coefficient (beta)	-.22
p-value	< .001
Relative negative effect in rural schools	1.7 times stronger
Conclusion	Significant moderation

The moderation analysis showed a statistically significant interaction between recreational smartphone use and school location (beta = -.22, p < .001). The negative effect of recreational smartphone use on academic outcomes was approximately 1.7 times stronger among rural-school students than among urban students.

Discussion of Findings

The central finding is that the relationship between smartphone use and academic achievement is purpose-dependent. Educational smartphone use was positively associated with academic outcomes, whereas recreational use was negatively associated with achievement. This supports the conceptual premise that smartphones can represent either digital learning resources or digital distractions depending substantially on how they are used.

The positive relationship between educational smartphone use and academic outcomes (r = .41, p < .001) suggests that smartphones can contribute meaningfully to secondary-school learning when students use them for academically productive purposes. This finding corresponds with Wang *et al*. (2024) [12], whose meta-analysis found that educational digital-device use was positively associated with academic performance. The result has particular significance for Nigerian public secondary education, where smartphones may provide relatively accessible pathways to supplementary academic content in settings with constrained instructional resources.

Conversely, recreational smartphone use was negatively associated with academic outcomes (r = -.38, p < .001). The finding indicates that students who devote greater smartphone engagement to entertainment, social media, gaming, and non-academic chatting tend to demonstrate poorer academic performance. This relationship may arise partly from time displacement. The result is consistent with Paterna *et al*. (2024) and Pyhältö *et al*. (2025) [10, 11], whose systematic evidence linked problematic or off-task smartphone use with poorer academic achievement.

An important descriptive finding is that recreational smartphone use (M = 3.68) exceeded educational smartphone use (M = 3.12). This suggests that students' smartphone ecosystems may presently be more strongly oriented towards leisure and social engagement than formal learning. The average daily screen time of 5.4 hours further illustrates the centrality of smartphones in students' daily lives, but the findings demonstrate why total screen time should be interpreted cautiously: the academic consequences depend substantially on what students actually do during that time.

The negative relationship between classroom phone use and attention (r = -.29) provides further evidence for the digital-distraction hypothesis. Classroom learning requires students to maintain attention long enough to encode, process, organise, and retain instructional information. Martin *et al*. (2025) [5] identified technology-related distractors as major sources of disruption and associated digital distraction with reduced sustained attention, multitasking, comprehension problems, poorer recall, procrastination, and impaired academic performance. Chen *et al*. (2025) [3] likewise reported a negative effect of mobile-phone distraction on immediate recall.

Self-regulated learning provides another useful explanation. Students with stronger self-regulation are more likely to distinguish between appropriate and inappropriate times for smartphone engagement, suppress notifications during study, resist recreational temptations, and use technology strategically. Conversely, students with weaker self-regulatory skills may struggle to terminate entertaining activities or resist habitual checking. Smartphone policies should therefore be accompanied by digital self-regulation education rather than relying exclusively on external restrictions.

Perhaps one of the most significant findings is the moderating role of school location. The negative association between recreational smartphone use and academic outcomes was approximately 1.7 times stronger in rural schools, with a significant interaction coefficient (beta = -.22, p < .001). Rural schools also recorded a lower school-resource index (M = 2.30) than urban schools (M = 3.60). These results suggest that digital distraction may interact with existing educational inequalities and may be more consequential where students have fewer complementary academic resources.

The regression model provides further evidence of the educational significance of smartphone-use patterns. Prior academic performance, educational smartphone use, and recreational smartphone use jointly explained 52% of the variance in academic outcomes. However, because the study uses a cross-sectional correlational design, the observed relationships establish association rather than definitive causal effects. Longitudinal and experimental research would be necessary to establish temporal and causal pathways more conclusively.

Overall, the findings reject both extremes of the smartphone debate. Smartphones cannot reasonably be classified as universally harmful educational distractions, because educational smartphone use showed a meaningful positive association with academic outcomes. Neither can smartphone access automatically be considered educationally beneficial, because recreational and classroom use were associated with poorer achievement and attention. The evidence therefore supports a purpose-sensitive and context-sensitive approach to smartphone management in Nigerian public secondary schools.

Conclusion and Recommendations

Conclusion

This study examined smartphone use patterns and academic outcomes among students in Nigerian public secondary schools, with particular emphasis on the distinction between smartphones as instruments of digital learning and sources of digital distraction. The findings demonstrate that the academic consequences of smartphone use are determined substantially by the purpose and context of use rather than smartphone use alone.

Educational smartphone use was positively associated with academic outcomes (r = .41, p < .001), while recreational smartphone use was negatively associated with academic outcomes (r = -.38, p < .001). Phone use during classroom instruction was negatively associated with students' attention (r = -.29). The negative effect of recreational smartphone use was approximately 1.7 times stronger among students in rural schools (beta = -.22, p < .001), while the regression model explained 52% of the variance in academic outcomes (R^2 = .52).

The study therefore rejects both complete technological optimism and blanket technological prohibition. Smartphones are neither inherently educational nor

inherently distracting. Their consequences depend on what students do with them, how long and when they use them, how effectively they regulate their behaviour, and the educational environment in which use occurs. A balanced policy that promotes productive educational engagement while controlling recreational and off-task use is therefore more appropriate for Nigerian public secondary schools than either unrestricted access or indiscriminate prohibition.

Recommendations

1. Schools should develop clear smartphone-use policies that distinguish educational use from recreational use and specify circumstances in which phones may be used for academic activities.
2. Teachers should deliberately integrate smartphones into structured learning activities where appropriate, including electronic textbooks, educational videos, digital assignments, learning applications, academic research and supervised collaborative activities.
3. Digital literacy and digital self-regulation should be incorporated into student orientation and counselling programmes, including screen-time management, notification control, online information evaluation and avoidance of digital multitasking.
4. School administrators should establish classroom-specific rules requiring phones to remain silenced or stored away during direct instruction, tests and other activities requiring sustained attention unless explicitly authorised for learning.
5. Particular intervention should be directed towards rural and under-resourced public secondary schools through improved internet connectivity, electricity, digital learning facilities, libraries, instructional resources and curated educational content.
6. Parents and guardians should provide age-appropriate supervision of students' smartphone behaviour outside school and encourage reasonable study routines and educational use.
7. Teachers, counsellors and parents should provide behavioural and counselling support for students exhibiting high levels of digital distraction rather than relying solely on punitive responses.
8. Educational authorities should provide continuous professional development for teachers in mobile and digital pedagogy, digital safety and classroom management of smartphone use.
9. Students should be encouraged to monitor both the quantity and quality of their screen time and to increase the proportion devoted to productive academic activities.
10. Future studies should adopt longitudinal and experimental designs and investigate additional mediating and moderating variables such as sleep quality, parental monitoring, motivation, teacher digital competence, internet affordability, peer influence and school policy.
11. National and state education authorities should adopt a balanced digital-learning framework for secondary schools that recognises smartphones as potentially useful educational resources while establishing safeguards against distraction and problematic digital behaviour.

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