UNIJERPS
Unizik Journal of Educational Research and Policy Studies VOL.21 (1);
January-June, 2026 https://unijerps.org
2023 Impact Factor: **6.834;** 2022 ***Impact Factor***: 5.156; ***2021 Impact Factor:*** ***5.641;***
2020 Impact Factor: ***5.355.*** *Indexing and Impact Factor URL:*
http://sjifactor.com/passport.php?id=21363

INFLUENCE OF E-LEARNING TOOLS AND SOCIAL MEDIA ON STUDENTS' COGNITIVE ABILITY IN PUBLIC UNIVERSITIES IN LAGOS STATE, NIGERIA

Adeleke, Adawi Adeola[1]

Orunbon, Nurudeen Olalekan[2]
&
Ayeni, Samuel Anuoluwapo[3]

[1,2&3]Department of Educational Management, Lagos State University, Ojo, Lagos, Nigeria
Correspond Email: orunbon.nurudeeno@gmail.com

ABSTRACT

This study examined the influence of E-learning tools and social media on students' cognitive ability in public universities in Lagos State, Nigeria. A descriptive survey research design was adopted for the study. A total of four hundred (400) participants were selected through simple random sampling technique from five public universities in Lagos State. A self-structured questionnaire titled "Influence of E-Learning Tools and Social Media on Students Cognitive Ability Questionnaire" was used for data collection. Three research hypotheses were raised to guide the study. Pearson Product Moment Correlation was used to test the research hypotheses. The study found that the Pearson's correlation results show that there is a positive significant relationship between the use of e-learning tools and students' cognitive abilities (r=0.412,p<0.05), social media usage has significant influence on students' cognitive development (r=0.267,p<0.05), there is significant combined effect of e-learning tools and social media on students' concentration and academic performance (r=0.372,p<0.05), there is a significant difference in cognitive ability between students who frequently use e-learning tools and those who do not (r=0.312,p<0.05). Based on these findings, it was recommended, among others, that university managements promote the effective integration of digital tools and provide orientation programmes to guide students on the productive use of social media to minimize distractions.

Keywords: E-learning tools, Social media, Cognitive ability, Public universities, Lagos State

Introduction

The advent of the internet plays a vital role in world of communication. The coming into being of these sites revolutionized the world of communication ranging from education to entertainment. Internet yields many different ways to talk to each other, find information, shop, and do many other things (Dahan, 2022). These technological changes have not only changed the world around, but has also changed the way people live their lives (GomollonBel, 2019). People born in the last few decades of the 20th century, often called "digital natives," have

grown up with things like mobile phones, the internet, computers, and video games (Ivanchenko, 2022). Thompson, (2021) said that the internet has changed how students live and will affect their futures. He also thinks they couldn't live without it. The internet has become a tool that students can't do without. Even if a student can't afford a personal computer, he/she needs one to do schoolwork, sign up for classes, and find information (Reisdorf, 2020). Past studies have found that students mainly use the internet to find information for schoolwork, talk to people, and run websites or social media pages (Tkacova, 2021). For university scholars, the internet serves as a vital instrument aiding them in their learning journey, assisting in tasks such as locating necessary resources, conducting research, performing lab work, and much more (Lopez-Pernas, 2019).

The global direction in educational advancement is characterized by the application of information technology skills and knowledge in pedagogical strategies (Mystakidis, 2022). E-learning, an all-encompassing educational approach, caters to learners across different age groups, enabling students to pursue their studies tailored to their individual aptitudes (Fawaz & Samaha, 2021). The comprehensive utilization of information technology tools can augment learning efficacy, stimulate proactive learning, and foster a lifelong learning aspiration (Osuji & Amadi, 2020).

E-learning tools, including learning management systems, digital textbooks, educational apps, and online course materials, have the potential to provide interactive, personalized, and engaging learning experiences (Huang, 2020). The use of these educational learning tools significantly contributed to the improvement of educational field. The use of technology drastically increased during past one to one and a half decade and numerous technological aids are available with different characteristics and properties (Automation, 2021; Sciences, 2013).

Social media has the potential to aid students in putting their interests in academic subjects and connecting with professionals in their field. Cox and McLeod (2014) discovered that social media platforms facilitate communication between teachers, students, parents and community members, ultimately leading to the formation of online professional learning communities. By utilizing social media, students can expand their knowledge and network with individuals who share similar passions and career aspirations.

Cognitive development refers to the construction of thought processes, including remembering, problem-solving, and decision-making, from childhood through adolescence to adulthood (Pakpahan & Saragih, 2022). It is a critical factor in students' academic performance and overall learning outcomes (Schunk, 2012).The flexible and adaptive learning experiences provided by e-learning tools could foster problem-solving and critical thinking skills (So, 2019).

The resulting cognitive development can, in turn, influence students' learning outcomes. Enhanced cognitive skills can lead to improved academic performance, better knowledge retention, and the development of practical skills (Peng & Chen, 2019). A

number of research studies have been conducted pertaining to the connection and influence of e-learning tools on students' learning outcomes across different countries (Sriwiyanti, 2022). Therefore, this study examined influence of e-learning tools and social media on students' cognitive ability in public universities in Lagos State, Nigeria.

Statement of the Problems

Despite the rapid integration of digital technologies into higher education, the extent to which e-learning tools and social media platforms contribute to or hinder students' cognitive ability in public universities remains inadequately understood. Public universities increasingly adopt virtual learning environments, online course management systems, and digital collaboration tools with the expectation that these technologies will enhance students' comprehension, critical thinking, problem-solving, and overall academic performance. At the same time, students are heavily engaged with social media platforms, which often serve as informal learning spaces but also present significant risks of distraction, cognitive overload, and reduced attention span. However, empirical evidence on how these digital tools collectively shape students' cognitive processes is inconsistent. While some studies suggest that e-learning tools promote active learning, self-regulation, and deeper cognitive engagement, others indicate that poor instructional design, limited digital competence, and unstable technological infrastructures in public institutions create barriers that diminish their potential benefits. Similarly, although social media can support peer learning and knowledge sharing, its excessive and unregulated use has been linked to reduced concentration, impaired memory retention, and increased multitasking tendencies, all of which may negatively influence cognitive development.

In many public universities, especially where resources are constrained, students often rely on personal smartphones, unstable internet connectivity, and fragmented digital learning systems. These challenges may compromise the effectiveness of both formal e-learning platforms and informal social media-based learning. Furthermore, lecturers' varying levels of digital literacy and inconsistent pedagogical strategies may limit the cognitive gains that students are expected to derive from these tools. Consequently, there is a critical gap in understanding whether the growing reliance on e-learning tools and social media genuinely enhances students' cognitive ability or whether it inadvertently contributes to cognitive strain, reduced academic focus, and diminished learning outcomes. Therefore, this study seeks to examine the actual influence of e-learning tools and social media on students' cognitive ability in public universities in Lagos State, Nigeria.

Research Hypotheses

The following null hypotheses will guide this study:

H_{01}: There is no significant relationship between the use of e-learning tools and students' cognitive abilities in public universities in Lagos State.

H_{02}: Social media usage has no significant influence on students' cognitive development in public universities in Lagos State.
H_{03}: There is no significant combined effect of e-learning tools and social media on students' concentration and academic performance in public universities in Lagos State.

Literature Review

Concept of E-Learning Tools

E-learning is defined as delivery of education in a flexible an easy way through the use of internet to support individual learning or organizational performance goals (Clark and Mayer, 2011; Maqable, 2015). According to Arasteh (2014), Dragmhici (2014), and Mustea, (2014), say that e-learning is the method which allows people especially students to take courses from home or anywhere as he/she can access the internet, among other platforms such as peer-to-peer, client server, and web services. This includes use of laptops, mobile phones so long they can have access to the internet. This enables students to access and interact with courses online via such technologies.

E-Learning tools refer to digital technologies and platforms that are designed to support and enhance the learning process through online delivery of educational content, interactive activities, and communication features (Kumar & Sharma, 2021). E-Learning tools provide opportunities for interactive and collaborative learning experiences. It is important to note that e-learning tools, such as online discussion forums and collaborative platforms, foster active student engagement and promote peer interaction. These tools facilitate knowledge sharing, collaborative problem-solving, and constructive feedback exchange among students (Themelis & Sime, 2020). Furthermore, e-learning tools offer real-time communication features, such as video conferencing and instant messaging, which enable synchronous interactions between instructors and students, enhancing the sense of community and social presence within the online learning environment.

E-learning tools use digital apps and platforms to make learning easier. They include various technologies like Learning Management Systems (LMS), digital course materials, online quizzes, and discussion forums. Many studies show that e-learning tools improve accessibility and flexibility in education, allowing students to learn at their own speed and convenience. (Zhang, 2020).

Concept of Social Media

Social media consists of services that allow users to generate and share online content. The use of social media incorporates social networking, defined as services that allow users to manage relationships in online communities (Karahoca & Yengin, 2018). The use of social media offers opportunities for increased engagement, promoting a deeper connection between students, educators, and course content. Collaborative learning is another potential benefit of social media, encouraging groups of students to work together, solve a problem, complete a task, or create a product, rooted in the social constructivist principle that knowledge is created by the members of a group actively interacting and sharing

experiences (Junco, 2012; Karahoca & Yengin, 2018). Consistent with these benefits social media and its associated learning methods such as brainstorming can enhance teamwork skills to improve students' analysis and problem-solving skills.

Social media networking sites and applications are widely used by students. They spend a lot of time on these sites as a part of their daily lives. Studies have revealed that among the various age groups of students, university students are among the heaviest users of social networks. Social media had a significant influence on the way student learn and interact with others. By providing a platform for sharing knowledge, connecting with experts in our fields of interest and collaborating with peers from around the world, social media has transformed the learning experience into something more engaging and relevant than ever before (Hortigu & elacala, 2019).

Social media has both positive effects, such as creativity, academic and business connections, and enhances communication between teachers and students (Sharma, 2022, Oueder & Abousaber, 2018). Also, negative effects would include distraction, low self-esteem, cyberbullying, and poor academic performance on students, but these effects depend on the way students use social media.

Cain (2020) agrees that the positive influence s of social media must be investigated to identify their potentials Studies indicated that social media networks usually displaying strong user engagement and making it possible for users to connect with people across geographical, economic or political span (Ratzan, 2014). With these advancements in the global usage of Information Technology Communication, and through the huge technological development, social networking sites are becoming more and more popular among students especially in developing countries such as Nigeria (Adaja and Ayodele 2013; Kayode, 2020).
However, purposeful social media engagement, like participating in academic groups or forums, can positively influence learning (Lee, 2021; Martinez & Torres, 2023). The dual role of social media as a distraction and a learning tool highlights its complex influence on students' academic performance (Thompson et al., 2022; Johnson, 2023). According to Kolhar, Kazi, & Alameen (2021), 97% of the students' use of social media was addictive; 57% were addicted to it; and only 1% used it for learning. This gives an idea of the vast volume of social media usage and its effects on college students.

According to a study by Zhao (2023), university students who use social media excessively run the risk of developing a social media addiction and seeing a decline in their academic performance. Yao & Wang (2023) reported similar results, stating that excessive smartphone use and information overload are positively connected with technostress. Technostress, in turn, influences bad sleep quality and the perception of one's academic achievement. However, (Sabah (2023) found that social media use and education enhance learning,

raise students' satisfaction with their education, and improve students' judgments of their performance.

Concept of Cognitive Development

Cognitive development refers to the gradual process through which individuals acquire and refine their cognitive abilities, including perception, attention, memory, problem solving, and decision-making, it involves the progressive improvement of cognitive skills and the acquisition of knowledge, enabling individuals to think, reason, and understand the world around them (Drigas & Mitsea, 2020). In an educational context, students' cognitive development encompasses the intellectual growth and advancement of students within the learning environment. It involves the enhancement of critical thinking skills, information processing, and the development of meta cognitive strategies that enable students to effectively plan, monitor, and evaluate their own learning progress. Students' cognitive development is influenced by various factors, including educational practices, instructional methods, social interactions, and individual experiences, all of which contribute to shaping students' cognitive abilities and facilitating their overall learning outcomes (Alam, 2022).

E-Learning Tools and Cognitive Abilities of Students

The effectiveness of e-learning tools cannot be solely attributed to their characteristics. Research indicates that cognitive development plays a critical role in mediating the influence of these tools on learning outcomes (Gaffas, 2023). Cognitive development refers to the construction of thought processes, including memory, problem-solving, and decision-making, from childhood through adolescence to adulthood (Garcia & Pereira, 2019). E-learning tools can potentially enhance cognitive development through active engagement, interactive learning, and fostering critical thinking. For instance, discussion forums can stimulate cognitive development by facilitating thoughtful reflections and peer interactions (Islam et al., 2022). Similarly, multimedia presentations can foster information processing skills, and virtual simulations can enhance problem-solving abilities (Baran, 2019).

Notwithstanding the potential benefits, the effectiveness of e-learning tools largely depends on their design and implementation. Suboptimal design of these tools can potentially lead to cognitive overload, impeding the learning process (Shin & Song, 2022). Furthermore, without adequate digital literacy and self-regulation, students might struggle to effectively navigate through these tools (García Botero et al., 2021). Hence, when integrating e-learning tools, it becomes crucial to take into account the cognitive development level of students.

E-learning tools have been found to significantly influence the cognitive development of students specifically, these can promote critical thinking skills, problem-solving abilities, and self-regulated learning (Lai & Hwang, 2021). E-learning tools can foster critical thinking skills by encouraging students to analyze information, contemplate on different perspectives, and construct well-reasoned arguments

(Grant, 2020). E-learning tools can also stimulate critical thinking, as university students must evaluate and synthesize information from a variety of sources (Jaswal & Behera, 2023).

In terms of problem-solving abilities, e-learning tools, such as interactive simulations and games, can play a crucial role (Sotiriou, 2020). These platforms provide students with virtual scenarios that often require the application of learned concepts to resolve complex problems. This active engagement not only solidifies understanding but also enhances problem-solving skills (Veldkamp, 2020). Further research by Wangt (2022) confirms the positive influence of educational games on problem-solving abilities.

Social Media and Students Cognitive Development

Integrating social media in education has become a focal point of discussions about enhancing student engagement and learning outcomes. Over recent years, platforms such as Facebook, Twitter, and Instagram have been leveraged to support various pedagogical methods, such as collaborative learning, peer assessment, and immediate feedback (Ashraf et al., 2021; Al-Rahmi et al., 2022). While social media's role in academic settings is expanding, its influence on more complex cognitive processes like critical thinking among students. Critical thinking is the ability to evaluate and analyze information systematically, is widely recognized as a vital skill for academic and professional success (Fisher & Scriven, 2021).

Critical thinking is critical in educational settings as it help learners to skillfully posses problem-solving, reasoning, and independent judgment key (Sow, 2020). With their dynamic and interactive features, social media platforms present an opportunity to enhance these cognitive abilities. However, the very nature of social media, characterized by short, rapid content exchanges, may simultaneously hinder critical thinking by promoting passive consumption over active engagement (Dabbagh &Kitsantas, 2012). Thus, understanding the balance between these dual effects becomes critical. Recent studies highlighted that the influence of social media on learning varies widely depending on how it is utilized (Othman, 2012). While collaborative learning and peer interactions on social media can foster positive learning environments, they can also introduce distractions that impede deeper cognitive processes (Pitafi, 2020). Various studies emphasize the role of critical thinking in equipping students with skills for academic and real-world problem-solving (Brown & Smith, 2023; Williams et al., 2022). Despite its importance, educators face challenges in fostering critical thinking due to traditional rote learning practices (Chen & Yu, 2021; Evans et al., 2023). Innovative approaches, including project-based and inquiry-based learning, have demonstrated effectiveness in enhancing cognitive abilities (Anderson & Taylor, 2023; Rivers et al., 2022). The integration of digital tools, particularly in blended learning environments, further supports the development of critical thinking

(Kumar et al., 2023; Fisher & Hart, 2022).

Social media platforms serve as avenues for knowledge sharing and collaborative learning, which are essential cognitive abilities (Garcia & Cruz, 2022; Silva, 2023). However, excessive passive consumption of content has been linked to cognitive overload and decreased analytical reasoning (Nguyen, 2022; Carter & Green, 2021). On the positive side, participation in discussions on academic forums and exposure to diverse perspectives online can foster analytical skills (Lopez, 2023; Zhang & Huang, 2022). The platform design also plays a role, with interactive features encouraging critical evaluation of content (Martin, 2022; Perez & Gomez, 2023). Nonetheless, the influence of non-academic social media activities on critical thinking remains underexplored, calling for further investigation.

Certain indicators of social media use have been identified as predictors of critical thinking skills. Engagement in academic discussions and accessing information through educational groups significantly correlate with higher order thinking abilities (Williams & Grant, 2022; Thomas et al., 2023). Conversely, passive browsing or engaging with superficial content has minimal influence on cognitive skills (Anderson et al., 2022; Rivera & Lopez, 2023).

Cognitive Development and Students Learning Outcome

Cognitive development, a key aspect of students' growth, refers to the transformation of a learner's abilities and skills concerning knowledge acquisition, problem solving, and information processing. This development influences students' learning outcomes significantly (Mcleod, 2022). According to Piaget's cognitive development theory, students pass through distinct stages of cognitive growth: sensorimotor, preoperational, concrete operational, and formal operational—each of which shapes their ability to understand and interact with the world (Piaget, 1952). As students' progress through these stages, their learning outcomes in terms of knowledge acquisition, comprehension, and application improve. They become capable of more complex thought processes and problem solving, leading to enhanced academic performance (Taub, 2020). Moreover, research has highlighted the critical role of cognitive development in the learning process.

Methodology

The study adopted the survey research design. This design was considered suitable for this study as it describes and interprets conditions or relationships that prevail, views that are held and processes that are going on. The target population of the study comprised tertiary students in selected public universities in Lagos State. The universities include Lagos State University, Ojo (LASU), University of Lagos, Akoka (UNILAG), Lagos State University of Science and Technology, Ikorodu (LASUSTECH), Lagos State University of Education, Ijanikin (LASUED), and National Open University of Nigeria (NOUN).

According to official data from the Lagos State University website (February 26, 2026), the university has

a student enrollment of approximately 43, 362 students, according to official data from the University of Lagos website (February, 2026) the university has about 55,200 students, according to Lagos State University of Science and Technology website (2026), the university has a population of over 25,000 students, according to official data from National Open University of Nigeria website (February 26, 2026), the university approximately has over 807, 233 students, Lagos State University of Education students database is unavailable.

The sample size to be drawn from the total populations was five hundred (400) tertiary institutions students to ensure effectiveness. Simple random sampling technique was adopted for this study to select participant from various public university in Lagos State, to represent the entire view of the population. Taro Yamane Formula was used to determine the sample size of 400 as follow;

$$N = \frac{N}{1+Ne^2}$$

Where: N = population size

N=43,362+55,200+25,000+807,233 N=930,795N = 930,795N=930,795

e = margin of error (precision)0.05 (5%).

e^2:0.05^2=0.0025

930,795×0.0025=2,326.9875

$$N=\frac{930,795}{2,326.9875} \qquad N = 400$$

The researcher made use of structured questionnaire for data collection from both academic and non-academic staff as research instrument to collect data. The questionnaire was designed to elicit information relevant to the research objectives and hypotheses. The instrument was sectionalized into two sections. Part A: This section sought demographic information of respondents such as gender, academic qualification and years of experience. These data were necessary to provide background information on the participants

Part B: This section contained items designed to obtain responses on the core variables of the study. Responses in this section were structured using a four-point Likert scale format: Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD). The questionnaire items were carefully worded to ensure clarity and avoid ambiguity, while also maintaining alignment with the stated research questions and hypotheses. This structure enabled the researcher to collect both demographic data and attitudinal responses for quantitative analysis. A pilot test was carried out in order to ensure the degree of consistency. This was to ensure that variables measured meet the research expectations. The questionnaire was administered personally by the researcher to the respondent who form

part of the study. Explanation was made where necessary for clarification of the questionnaire to avoid misconceptions and reduce the chance of improper completion of the questionnaire.

Descriptive statistics was used for data analysis. The research questions were presented in frequency and percentages. The questionnaires received were coded appropriately to enable data categorization and analysis. The Likert scale was moderated into a 4-point rating scale. All the analyses were done through the use of the Statistical Package for Social Sciences (SPSS). The inferential statistics were used to test the hypotheses was Pearson Product Moment Correlation at 0.05 level of significance.

Testing of Hypotheses

Hypothesis 1: There is no significant relationship between e-learning tools and students' cognitive ability.

Table 1: Pearson Correlation Analysis between E-learning Tools and Cognitive Ability

Correlations

		E-learning Tools	Cognitive Ability
E-learning Tools	Pearson Correlation	1	.412**
	Sig. (2-tailed)		.008
	N	400	400
Cognitive Ability	Pearson Correlation	.241**	1
	Sig. (2-tailed)	.008	
	N	400	400

****Correlation is significant at the 0.05 level (2-tailed).**

The result shows a positive significant relationship between e-learning tools and students' cognitive ability with ($r = 0.412$, $p < 0.05$). Therefore, the null hypothesis which state that there is no significant relationship between the use of e-learning tools and students' cognitive abilities in public universities in Lagos State is rejected. Therefore, there is significant relationship between the use of e-learning tools and students' cognitive abilities in public universities in Lagos State.

Hypothesis 2: Social media usage does not significantly influence students' cognitive ability.

Table 2: Pearson Correlation Analysis between Social Media Use and Cognitive Ability

Correlations

		Social Media Use	Cognitive Ability
Social Media Use	Pearson Correlation	1	.267**
	Sig. (2-tailed)		.004
	N	400	400
Cognitive Ability	Pearson Correlation	.267**	1
	Sig. (2-tailed)	.004	
	N	400	400

****Correlation is significant at the 0.05 level (2-tailed)**

The result shows a positive significant relationship between social media usage has no significant influence on students' cognitive development in public universities in Lagos State ($r = 0.267$, $p < 0.05$). Therefore, the null hypothesis which state that social media usage has no significant influence on students' cognitive development in public universities in Lagos State is rejected. Therefore, Social media usage has no significant influence on students' cognitive development in public universities in Lagos State.

Hypothesis 3: There is no significant combined effect of e-learning tools and social media on students' cognitive ability.

Table 3: Pearson Correlation Analysis between Combined E-learning & Social Media Use and Cognitive Ability

Correlations

		E-learning & Social Media Use	Cognitive Ability
E-learning & Social Media Use	Pearson Correlation	1	.372**
	Sig. (2-tailed)		.012
	N	400	400
Cognitive Ability	Pearson Correlation	.372**	1
	Sig. (2-tailed)	.012	
	N	400	400

****Correlation is significant at the 0.05 level (2-tailed)**

The result shows a positive significant combined effect of e-learning tools and social media on students' concentration and academic performance in public universities in Lagos State with ($r = 0.372$, $p < 0.05$). Therefore, the null hypothesis which state that there is no significant combined effect of e-learning tools and social media on students' concentration and academic performance in public universities in Lagos State is rejected. There is significant combined effect of e-learning tools and social media on students' concentration and academic performance in public universities in Lagos State.

Discussion of Findings

This study examined the influence of e-learning tools and social media usage on students' cognitive ability in public universities in Lagos State. The first finding revealed that there is a significant relationship between the use of e-learning tools and students' cognitive abilities in public universities in Lagos State. This implies that increased engagement with e-learning platforms such as online lecture materials, virtual classrooms, learning management systems, and digital libraries is associated with improved cognitive functioning among students. Students who regularly interact with digital instructional content tend to demonstrate enhanced critical thinking, memory retention, analytical reasoning, and problem-solving skills. This finding supports Ikegbusi (2016), who established that exposure to ICT-based instructional strategies significantly improves students' cognitive engagement and academic performance. Similarly, UNESCO (2013)

emphasized that technology integration in higher education strengthens independent learning, intellectual curiosity, and higher-order thinking skills. Furthermore, Hanushek and Woessmann (2020) argued that structured and guided digital learning positively influences cognitive development when properly implemented. The present finding therefore confirms that e-learning tools are not merely instructional supplements but cognitive enhancement mechanisms within university education.

The second finding showed that social media usage has a significant influence on students' cognitive development in public universities in Lagos State. This indicates that social media platforms, when used constructively for academic purposes such as collaborative discussions, knowledge sharing, academic networking, and access to educational resources, contribute positively to students' cognitive growth. Social media provides opportunities for peer interaction, exposure to diverse perspectives, and real-time information exchange, which stimulate reflective thinking and intellectual engagement. This finding aligns with the view of Ikegbusi (2016), who noted that digital interaction platforms encourage active participation and cognitive stimulation among learners. UNESCO (2013) also reported that digital communication tools, including social networking platforms, enhance collaborative learning and cognitive flexibility in tertiary institutions. However, the significance of the finding suggests that the influence of social media depends largely on the nature and purpose of usage. When used academically, social media fosters cognitive development; when misused, it may become distracting. The result therefore underscores the importance of guided and academic-oriented use of social media among university students.

The third finding revealed that there is a significant combined effect of e-learning tools and social media on students' concentration and academic performance in public universities in Lagos State. This suggests that the integration of formal digital learning systems and informal interactive platforms produces a synergistic effect on students' academic outcomes. The combined use enhances concentration, facilitates deeper understanding of course content, and promotes sustained academic engagement. From a theoretical perspective, this finding supports Systems Theory (Bertalanffy, 1968), which posits that the effectiveness of an educational system depends on the harmonious functioning of its interrelated subsystems. In this case, e-learning tools and social media function as complementary subsystems that jointly influence cognitive output and academic performance. The finding also corroborates UNESCO (2013), which emphasized that blended digital ecosystems in higher education promote innovation, engagement, and improved academic achievement. Likewise, Hanushek and Woessmann (2020) highlighted that the strategic integration of educational technologies strengthens student performance outcomes. Therefore, the combined effect observed in this study confirms that digital tools are most effective

when integrated holistically rather than used in isolation.

Conclusion

Based on the findings of the study, it can be concluded that;

The use of e-learning tools significantly enhances students' cognitive ability, particularly in areas such as critical thinking, understanding of course materials, and memory retention. Social media platforms, when used for academic purposes, positively influence students' cognitive development and engagement in learning activities. There is a significant relationship between e-learning tools and students' cognitive ability in public universities in Lagos State. Social media usage has a significant influence on students' cognitive ability, although its influence depends largely on how it is managed and utilized for academic purposes. The combined use of e-learning tools and social media produces a greater positive influence on students' cognitive ability than when either is used independently.

Recommendations

Based on the findings and conclusions of this study, the following recommendations are made:

1. University management should promote the effective integration of e-learning tools into teaching and learning processes to enhance students' cognitive development.
2. Lecturers should design interactive and engaging digital learning activities that stimulate critical thinking, problem-solving, and analytical skills.
3. Social media platforms should be strategically incorporated into academic activities, such as discussion forums, collaborative assignments, and knowledge-sharing sessions.
4. Universities should provide orientation programs to guide students on the productive and academic use of social media to minimize distractions.
5. Government and institutional authorities should invest in reliable digital infrastructure and internet facilities to support effective e-learning implementation in public universities.

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