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USE OF MOBILE APPLICATION, TIME INVESTMENT, AND ACADEMIC ENGAGEMENT OF STUDENTS AT GODFREY OKOYE UNIVERSITY

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Abstract

Purpose: *The paper aimed to find out the relationship between the use of mobile application, time investment, and academic engagement of students at Godfrey Okoye University. It examined how the type of mobile applications used and time spent on mobile devices influence the behavioral, cognitive, and emotional engagement of the undergraduate students.*

Design/Methodology/Approach: *Descriptive design was used for the study. Four research questions and four hypotheses guided the study. The population of the study was 395 and copies of questionnaire were distributed based on a stratified random sampling technique with a retrieval success of 372 copies, representing 94.2% return rate. The study used descriptive statistics and multiple regression for data analyses.*

Findings: *The findings of this study revealed that students who mostly used academic applications such as e-library platforms and research databases demonstrate higher levels of academic engagement ($\beta = 0.512$, $p < 0.05$), while those who use non-academic applications like social media and gaming is associated with lower academic engagement levels ($\beta = -0.436$, $p < 0.05$). It also found that time spent on mobile devices also have significant influences on academic engagement, however, the effect depends largely on whether usage is for academic or non-academic purposes. The study found that academic engagement is influenced more by the purpose of use than by length of time alone. Furthermore, the study found that cognitive engagement has the most significant influence, followed by behavioral and emotional engagement.*

Originality/Value: *This study provides useful insights for librarians, educators, and policymakers on how mobile technology can be better harnessed to improve student engagement and support effective digital learning environments in universities. The study recommends time management training to help students control the amount of time they spend on gadgets that are not useful for their academic work. Also, academic libraries should enhance access to library services via mobile applications*

Paper type*: Empirical research*

Keywords: *Mobile Device Usage; Academic Engagement; University Libraries; Mobile Applications; Cognitive Engagement; Behavioral Engagement; Emotional Engagement; Learning.*

Introduction

Mobile devices have become one of the most common tools that shape students' learning behavior and academic engagement. Devices such as smartphones, tablets, etc., have become an integral part of the modern education process. The rapid development and widespread use of mobile devices have led to significant changes in higher education worldwide. While traditionally, students had to perform learning tasks within a specific place, recently their engagement has become dynamic and mobile-based. (Lau et al., 2017; West, 2013).

Different types of applications exist on mobile devices, and the type of apps most students use is a primary factor in assessing the extent that mobile devices' influence students' academic engagement. With the use of academic mobile applications, students will be able to have easy access to their learning and library resources no matter

where they are at any given time. This will ensure that students have high levels of academic engagement. The use of academic mobile applications will enable them to conduct research, obtain scholarly literature, and perform academic work. Students can obtain journal articles, textbooks, dissertation papers, and research papers from academic applications such as Google Scholar, JSTOR, and ScienceDirect among others. Also, university library applications help students to find these academic resources. Similarly, students can get lecture notes, submit their assignments, and communicate with their lecturers using learning applications such as Google Classroom, Moodle, and Canvas (Saragossi, 2018)

Time investments involve the time students spend using their mobile devices for academic or non-academic purposes. Some measures of time investments include the hours per day spent using mobile devices, the frequent use of applications associated with the library (e.g., online catalogues and databases), and the time devoted to each academic session using these tools. These measures reveal the extent of students' involvement in using library applications on their mobile devices. Where students frequently use library applications (e.g., on a daily basis or multiple times per week), it would imply more frequent use and greater engagement with library applications. As such, time investment is not limited to the duration spent on the usage of smartphones by students; it also covers how frequently and meaningfully they interact with applications associated with their academic pursuits (She et al., 2022; Zhao et al., 2025).

This research defines academic engagement as more than just attending classes. Rather, it involves the frequency at which students engage in academic content, library resources, and services using mobile technologies. It is an essential component that determines students' academic performance as well as the impact of educational institutions. It encompasses the extent to which a student becomes involved in the learning process and how much effort they put into participating in the learning process. It is a multifaceted concept that encompasses emotional, behavioral, and cognitive aspects. Behavioral engagement deals with students' behavioral involvement in academic and library-related activities. It can be measured using factors such as, class attendance, assignment completion, library visits, OPAC usage, database searching, interaction with any of the numerous academic resource sources that exists online (Fredericks et al., 2004: Kuh, 2009). The

emotional aspect involves the feelings, motivation, and sense of belonging of the students. This can be measured by gauging how happy the students are with the services that are offered by the library, their motivation towards academics, and how they perceive the importance of study materials. The cognitive aspect is an indication of the intellectual effort that students employ during their studies. This type of effort involves critical thinking, thorough understanding, individual inquiry, and efficient utilization of the available sources of information. These are generally measured based on the ability of the students to analyze and utilize the academic materials available in the library. The cognitive aspect reflects students' intellectual effort, it involves students' efforts in understanding and mastering knowledge (Zheng, Zeng, Huang, & Sun, 2024).

Godfrey Okoye University, Enugu, is a private, faith-based institution that places a premium on discipline and digital learning. The university has made significant efforts to improve its library facilities as well as ICT infrastructure to enhance academic excellence. Anecdotal evidence shows that most students at Godfrey Okoye University use mobile phones in their library for academic and leisure activities. It makes the university a compelling context and a suitable place for conducting this research. Consequently, the research paper seeks to analyze the use of mobile application, time investment, and academic engagement of students at Godfrey Okoye University. The study shall therefore provide empirical evidence in a Nigerian context and, at the same time, contribute to the wider field of mobile learning. It will provide practical guidelines for improving student engagement in technologically driven educational settings.

Statement of the Problem

Mobile devices no doubt offer significant opportunities that can improve learning experiences, but their widespread adoption by students raises some concerns such that mobile devices negatively impact academic engagement. Some universities have placed restrictions on the use of mobile devices while others have out rightly banned students from the use of mobile devices especially smart phones (Cable, 2023) However, very little research effort has gone into studying how specific uses of mobile devices influence academic engagement. A number of studies have been conducted which relate to the variables in this study, very few studies exist which combine these variables to give a holistic picture of their relationship, especially in libraries of developing countries. This research fills these gaps by

looking at the interactive relationship of application type and time investment on academic engagement and how these interact to produce effects on behavioral, cognitive, and emotional engagement of students.

Research Questions

The following research questions guided the study:

1. To what extent does the type of mobile applications utilized by students influence their academic engagement within university libraries?
2. What is the effect of time spent on mobile devices on students' academic engagement?
3. What is the combined effect of application type and time spent on academic engagement?
4. How do patterns of mobile device usage influence the behavioral, cognitive, and emotional dimensions of students' academic engagement?

Hypotheses

The following null hypotheses are formulated to guide the study:

H_{01}: Application type does not significantly influence students' academic engagement in university libraries.

H_{02}: Time spent on mobile devices does not significantly affect students' academic engagement.

H_{03}: There is no significant interaction effect between application type and time spent on academic engagement.

H_{04}: Mobile device usage patterns do not significantly influence behavioral, cognitive, and emotional engagement.

Literature Review

Studies have shown that a majority of undergraduate students possess smartphones which they often use to obtain information, communicate with peers, and engage in academic-related activities. This demonstrates the critical importance of mobile devices within learning institutions, such as libraries. Mobile devices, as the main digital gadget in Nigeria, are being used by students in higher institutions of learning to access digital information due to infrastructure limitations as well as the cost of using computers. Using mobile devices, students can gain access to an academic library's database, repositories and numerous academic materials from any location and at any time. Students are therefore becoming heavily reliant on these mobile devices for learning purposes, including accessing library services and participating in learning activities via the internet. However, increased

use of mobile gadgets has raised concerns regarding the level of distraction and lack of concentration during learning activities (Schlak, 2018; Shah et al., 2025; Shoaib, Shamsher, & Iqbal, 2025; Vuojärvi, 2013; Wen, 2025).

Mobile applications (also known as mobile apps) are referred to as mobile operating systems installed on smart devices through application software and are capable of carrying out advanced computing and a wide range of functions, including but not limited to calendar, emails, social networking, web browsing, and online gaming via application software. Mobile applications can be classified into academic apps (such as databases, learning management systems, e-libraries, etc.) and non-academic apps (social media and entertainment). By increasing information access, promoting collaboration, and fostering knowledge creation, academic applications create greater cognitive engagement. They also provide students with better access to institutional repositories and contribute to learning processes. Mobile apps are effective tools that libraries can use to enhance students' learning processes; they make learning flexible and accessible. With the provision of academic mobile applications to students, they will be able to improve their involvement in learning, frequent use of library materials, and overall academic engagement in the university environment. Various academic applications, including reading software, research databases, and note-taking applications, have successfully created opportunities for deep learning and engagement. However, non-academic apps, such as social networking applications, games, and entertainment, have been shown to reduce the length of time spent on activities (Saragossi, 2018). Hence, the types of apps contained within mobile devices and how these apps are used play an integral role in influencing students' engagement academically (Mahdiuon et al., 2020). On the other hand, non-academic applications may negatively affect the level of engagement of students, as they can distract them from study tasks and diminish the quality of learning interactions. The excessive consumption of non-academic applications is associated with decreased academic engagement and negatively affects the academic success and engagement of students. There are arguments that non-academic apps like social networking sites play a crucial role and that they are sometimes beneficial in enhancing social interaction; however, very often they become a distraction for students. In addition, notable distinctions in the way undergraduate and postgraduate students use mobile devices

within educational context has been observed. The differences identified include variations in the frequency of use, purpose of use, and engagement levels. For instance, unlike postgraduate students, undergraduate students tend to take part in a wide range of activities, some of which are unrelated to their studies. Conversely, postgraduate students often use mobile devices for intensive research (Ahn, 2011; Glackin et.2014; Owansuan Olalere & Soyemi 2022).

Time investment refers to the amount of time students spend using mobile devices and how intense such usage may be. Time allocation for working with mobile devices is an important determinant of academic engagement. It has been the subject of extensive discussion in the research literature. While moderate use of mobile devices for academic purposes can enhance learning, excessive use, particularly for non-academic activities, has been linked to decreased academic performance and engagement. Studies indicate that students who spend a significant amount of time in front of screens tend to engage in multitasking, and experience cognitive overload, both of which have a detrimental impact on their capacity to concentrate and remember information. The patterns of social media use throughout the day have a substantial influence on the behaviors of students regarding library visiting and engagement. This implies that how time is distributed greatly determines the results of academic efforts. For example, while spending more time on academic applications leads to positive engagement outcomes, spending extended periods on non-academic applications contributes to increased disengagement. The effect of spending time on mobile devices is often associated with their utilization. Some researchers have also indicated that there is an interplay between the type of application and time spent. Students who spend a significant amount of time on applications related to academics tend to show more engagement than those who spend similar amounts of time on other non-academic applications (Adetayo, 2025; Atas & Çelik, 2019; Dobbins & Denton, 2017; Northey et al., 2018; Rosen et al., 2013)

Academic engagement is defined as a multidimensional construct that includes behavioral, cognitive, and emotional factors. Academic engagement is an intricate term that describes the extent of participation, commitment, and engagement of students in the academic process. Academic engagement

is more than just physically being present in class; rather, it entails the level of interaction of students with the task, resources, and the environment. Academics regard academic engagement as a multidimensional construct since it involves emotions, behaviors, and cognition, which helps students achieve academically and continue their studies. Behavioral engagement pertains to the observable participation of students in academic pursuits, including regular class attendance, completion of assignments, class discussion, library visits, borrowing of books, online catalogue search, database search, and other library resources. At the university library level, behavioral engagement can be quantified by factors such as library attendance frequency, OPAC search frequency, database search frequency, borrowing frequency, electronic resource usage, and participation in library orientation programmes or academic workshops. Behaviorally, students' academic engagement can be described through their involvement in academic activities such as reading, writing notes, and working with resources provided in libraries. Mobile reading behavior changes over time, users shift between low, medium, and high engagement depending on certain factors including past behavior, and usage habit (Zhao et al., 2025).

Cognitive engagement represents the extent to which students invest intellectually in the learning process by applying deep learning skills, thinking critically, and self-regulating their actions. According to Liu et al. (2023), mobile reading enhances students' cognitive engagement since it enables them to easily gain access to learning materials and helps them learn more flexibly. Nevertheless, fragmented reading may also influence comprehending and retaining information: while people read on their smartphones, they tend to stop reading at some point and switch to messaging or other apps. Finally, emotional engagement is related to students' affective reactions to the learning experience, such as feeling motivated or bored. These three types of engagement impact students' learning process and results. The interplay between the types of application and time spent adds another dimension of complexity to studying engagement behavior. Nonetheless, misuse of allocated time might result in diminished cognitive and behavioral engagement and poor learning results (Singh et al., 2022; Faro, Gutu & Hunde, 2025; Pentaraki & Burkholder, 2017; Manwaring, 2017).

The emotional aspect relates to students' emotions, attitudes, and level of affiliation with the learning process. Emotional aspects

include such factors as: an interest in studying, motivation to study, students' level of satisfaction with library services, perception of usefulness of library facilities and academic resources, confidence when interacting with the library, etc. From the point of view of working with the library, emotional engagement could be determined by the students' satisfaction with library services, usefulness of mobile application of libraries, motivation to use academic resources, feeling comfortable working with library resources, and affiliation with the learning process (Guo & Wang, 2025)

The cognitive component represents the psychological involvement of students in their learning process. This aspect relates to students' level of mental engagement in such processes as problem solving, critical thinking, understanding of materials studied, the effective usage of different techniques of learning, etc. The cognitive engagement shows how psychologically involved students are in learning knowledge and not just performing some actions to complete the assessment process. Cognitive engagement within the library context could be assessed through the amount of independent research, the critical usage of information sources, the proper usage of academic databases, etc. (Sedaghat et al.,2011)

Research Design

The study employed a descriptive survey research design for studying relationships between variables. The population of this study consists of all the undergraduates of Godfrey Okoye University, and it is estimated that there are about 3,500 undergraduates in this university. To derive the sample size, this study used the Taro Yamane (1967) formula: Hence, the sample size of this study is 359 students. Adding an additional 10% to allow for non-response results in a final sample size of 395 respondents. A stratified random sampling method was used whereby different strata such as the faculties were selected and the respondents were selected proportionately from each strata. Accordingly, each faculty forms one stratum in this study. Data collection was through the use of a structured questionnaire titled: “Mobile Device Usage and Academic Engagement Questionnaire (MDUAEQ)”. Responses were measured using a 5-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1). The instrument was subjected to face and content validity by experts in Library and Information Science and Educational

Technology. Their feedback ensured that the items adequately captured the variables under investigation. The reliability of the instrument was determined using Cronbach's Alpha, yielding a coefficient of 0.82, indicating high internal consistency. The questionnaire was administered and respondents were given adequate time to complete the instrument, and a high response rate (372) was achieved. Data collected were analyzed using descriptive statistics (mean, standard deviation) and inferential statistics (multiple regression, ANOVA). The analyses were conducted using SPSS, and results were presented in tables aligned with the research questions.

RESULTS AND ANALYSIS OF THE DATA

QUESTION ONE: How does the type of applications used influence students' academic engagement in university libraries?

Table 1: Descriptive Statistics and Regression Analysis of Application Type on Academic Engagement

Variable	N	Mean	Std. Dev.	Beta (β)	t-value	Sig. (p)
Academic Applications	372	4.18	0.62	0.512	9.874	0.000
Non-Academic Apps	372	2.85	0.79	-0.436	-8.215	0.000
Constant						
$R^2 = 0.48$						

The results presented in Table 1 indicate that the kind of applications utilized makes a significant difference in how engaged students are academically. Specifically, applications for academic purposes have a significant and strong positive impact ($b = 0.512$, $p < 0.05$), implying that students whose devices contain applications such as e-libraries and databases engage more effectively in their academic work. However, non-academic applications have a significant and strong negative impact ($b = -0.436$, $p < 0.05$), meaning that actions like gaming and social media usage result in reduced engagement in the library. The strength of association ($R2 = 0.48$) implies that 48% of variation in academic engagement is influenced by application types. This is consistent with findings by Salisbury et al. (2015), where they noted that academic success was mainly determined by the purpose for which the devices were used. Similar findings were obtained by Mahdiuon et al. (2020).

Research Question Two: What is the effect of time spent on mobile devices on students' academic engagement?

Table 2: ANOVA and Regression Analysis of Time Spent on Academic Engagement

Time Category (Hours/Day)	N	Mean Engagement	Std. Dev.	F-value	Sig. (p)
1–2 Hours	128	4.10	0.58		
3–5 Hours	146	3.45	0.71		
Above 5 Hours	98	2.88	0.83		
Total	372	3.49	0.76	27.63	0.000

The analysis revealed a statistically significant difference in academic engagement across levels of time spent on mobile devices ($F = 27.63$, $p < 0.05$). Students who spent 1–2 hours per day on mobile devices recorded the highest academic engagement ($M = 4.10$, $SD = 0.58$), followed by those using 3–5 hours ($M = 3.45$, $SD = 0.71$), while those using more than 5 hours showed the lowest engagement ($M = 2.88$, $SD = 0.83$). This indicates a clear declining trend in academic engagement as time spent on mobile devices increases. The pattern suggests that moderate and purposeful mobile use may support academic engagement, particularly when directed toward academic applications such as library resources and learning platforms. In contrast, excessive use may reduce engagement due to distraction, multitasking, and reduced time for focused academic activities. This finding is consistent with prior studies which report that prolonged mobile device use negatively affects concentration and academic involvement due to cognitive overload and increased distraction (Khan et al., 2021; Atas & Çelik, 2019). Similarly, Adetayo (2025) noted that heavy engagement with non-academic mobile applications reduces students' participation in academic activities, including library use. Overall, the findings indicate that time spent on mobile devices significantly influences academic engagement, with moderate use appearing more supportive than excessive use.

Research Question Three: What is the combined effect of application type and time spent on academic engagement?

Table 3: Two-Way ANOVA Showing Interaction Effect of Application Type and Time Spent

Source of Variation	Sum of Squares	df	Mean Square	F-value	Sig. (p)
Application Type	182.45	1	182.45	31.28	0.000
Time Spent	215.73	2	107.87	18.49	0.000
Interaction Effect	96.54	2	48.27	8.27	0.000
Error	2113.62	366	5.78		
Total					

The two-way ANOVA results show that both application type and time spent significantly influence students' academic engagement ($p < 0.05$), and importantly, there is a significant interaction effect between the two variables ($F = 8.27$, $p < 0.05$). This indicates that the effect of time spent on academic engagement depends on the type of application used. Specifically, students who spend more time on academic applications tend to maintain relatively higher levels of engagement compared to those using non-academic applications, where increased time is associated with a sharper decline in engagement. This suggests that application type moderates the relationship between time investment and academic engagement. This finding aligns with Zhao et al. (2025) and She et al. (2025), who emphasize that mobile engagement outcomes depend on both content type and usage patterns. Overall, the results show that academic engagement is jointly shaped by application type and time spent, rather than by either factor alone.

Research Question Four: How do mobile device usage patterns influence the behavioral, cognitive, and emotional dimensions of students' academic engagement?

Table 4 Multiple Regression Analysis of Mobile Device Usage Patterns on Engagement Dimensions

Engagement Dimension	Beta (β)	t-value	Sig. (p)	Interpretation
Behavioral	0.468	8.92	0.000	Significant Positive
Cognitive	0.532	9.75	0.000	Strong Positive
Emotional	0.389	7.11	0.000	Moderate Positive
$R^2 = 0.55$				

The multiple regression results show that mobile device usage patterns significantly predict all three dimensions of students' academic engagement, behavioral, cognitive, and emotional ($p < 0.05$), with an R^2 of 0.55 indicating a substantial level of explanatory power. This suggests that how students use mobile devices plays an important role in shaping their engagement with academic activities. Among the three dimensions, cognitive engagement has the strongest relationship ($\beta = 0.532$), followed by behavioral ($\beta = 0.468$) and emotional engagement ($\beta = 0.389$). This indicates that mobile devices are most strongly associated with students' thinking processes and use of academic information, moderately linked to participation in academic activities, and less strongly connected to motivation or emotional attachment to learning. Overall, the findings suggest that mobile devices

mainly support academic engagement in functional and cognitive ways rather than emotional ones. This aligns with Liu et al. (2023), who found that mobile learning tools enhance cognitive engagement by improving access to academic materials and supporting deeper information processing.

Test of Hypotheses

Each hypothesis formulated for the study was tested using appropriate inferential statistics, and the results are interpreted in line with existing literature. The decision rule is to: Reject H_0 if $p < 0.05$

Hypothesis One (H_{01})

H_{01}: Application type does not significantly influence students' academic engagement in university libraries.

Table 5: Regression Analysis for Application Type and Academic Engagement

Variable	Beta (β)	t-value	Sig. (p)
Academic Applications	0.512	9.874	0.000
Non-Academic Apps	-0.436	-8.215	0.000
$R^2 = 0.48$			

There is a positive relationship between academic applications usage and academic outcomes ($\beta = 0.512$, $p < 0.05$). The more frequently students use of academic applications, the more their academic engagement in university libraries increases. However, there is a negative relationship between non-academic applications and academic engagement ($\beta = -0.436$, $p < 0.05$). It means that when there is more non-academic usage, academic engagement will be lower. With an R^2 value of 0.48, the model explains 48% of variance of academic outcomes. Academic applications positively influence students' academic engagement but non-academic applications negatively influence it. Such findings correlate with the study conducted by Salisbury et al. (2015). The authors highlighted that mobile device usefulness depends on their usage. Similar results were obtained by Mahdiuon et al. (2020).

Hypothesis Two (H_{02})

H_{02}: Time spent on mobile devices does not significantly affect students' academic engagement.

Table 6: ANOVA Result for Time Spent and Academic Engagement

Source of Variation	Sum of Squares	df	Mean Square	F-value	Sig. (p)
Between Groups	215.73	2	107.87	27.63	0.000
Within Groups	1432.18	369	3.88		
Total					

From the ANOVA results, there is a significant difference between the groups ($F = 27.63$, $p = 0.000 < 0.05$). In other words, the groups do not perform similarly; at least one group significantly varies from the others. From the large between-group variance (215.73) compared to within-group variance, we can tell that the variance is highly significant. Our findings agree with Khan et al., 2021, on the detrimental effect of extended mobile phone usage on students' academic engagement. They also align with the findings of Atas and Çelik (2019), where the authors state that too much usage of smartphones affects their concentration.

Hypothesis Three (H_{03})

H_{03}: There is no significant interaction effect between application type and time spent on academic engagement.

Table 7: Two-Way ANOVA for Interaction Effect

Source of Variation	Sum of Squares	df	Mean Square	F-value	Sig. (p)
Application Type	182.45	1	182.45	31.28	0.000
Time Spent	215.73	2	107.87	18.49	0.000
Interaction Effect	96.54	2	48.27	8.27	0.000
Error	2113.62	366	5.78		

Findings indicate that application type and usage time significantly affect academic engagement ($p=0.000<0.05$). Importantly, the interaction effect is significant ($F=8.27$, $p=0.000$), signifying that the effects of application type on academic engagement are dependent on the level of usage time. There is a significant interaction effect between application type and usage time for academic engagement. The study result confirms the findings of Zhao et al. (2025), who found out that user engagement was influenced by content type and usage time. Additionally, the findings support the study by She et al. (2025), who found that fragmented academic engagement levels were affected by mobile technology usage time.

Hypothesis Four (H_{04})

H_{04}: Mobile device usage patterns do not significantly influence behavioral, cognitive, and emotional engagement.

Table 8: Multiple Regression Analysis for Engagement Dimensions

Engagement Dimension	Beta (β)	t-value	Sig. (p)
Behavioral	0.468	8.92	0.000
Cognitive	0.532	9.75	0.000
Emotional	0.389	7.11	0.000
$R^2 = 0.55$			

All three engagement dimensions, behavioral (β = 0.468), cognitive (β = 0.532), and emotional (β = 0.389), have positive and statistically significant effects (p = 0.000 < 0.05).

This implies that the use of mobile devices significantly impacts all engagement aspects, with the highest impact being on cognitive engagement. The value of R^2=0.55 shows that 55% of engagement variance is accounted for by mobile device usage. Reject H_{04} and accept H_{14}. Mobile device usage significantly affects behavioral, cognitive, and emotional engagement. This finding supports the study by Liu et al. (2023) which revealed that mobile reading promotes cognitive engagement via better access to scholarly materials. Similarly, Nguyen et al. (2023) noted that mobile library applications contribute to students' learning experience and involvement. On the other hand, the relatively low impact on emotional engagement points to the limitations of mobile devices in addressing the motivational dimension of education, as highlighted by Appleton (2020).

Summary of Hypotheses Testing

Hypothesis	Statement	Decision
H_{01}	Application type has no significant influence	Rejected
H_{02}	Time spent has no significant effect	Rejected
H_{03}	No interaction effect exists	Rejected
H_{04}	No influence on engagement dimensions	Rejected

The results obtained from hypothesis testing indicate that the use of mobile devices plays an important role in enhancing student engagement at Godfrey Okoye University. The independent and combined effects of application type and time on student engagement are both statistically significant. The implications are not only behavioral and cognitive but also emotional. This research contributes to the existing literature that supports the idea that mobile devices should be used wisely.

Conclusion

This study presents an empirical proof that mobile device usage is one of the factors affecting the degree of engagement among students in university libraries. The findings indicate that not only does the nature of application used and the time taken matter, but both aspects work together to affect the extent and nature of engagement. In line with the findings, there are two distinct effects, namely the effect of academic-oriented applications that promote engagement due to the provision of easy access to materials and facilitation of learning. Non-academic applications hinder engagement due to the creation of distractions that interfere with concentration. It is clear that there is a threshold effect whereby while the use of mobile devices in small quantities is helpful for engagement, excessive use undermines the usefulness of these gadgets. In essence, the research demonstrates that there is significant interaction between the nature of application used and time devoted to it.

From the results above, it is clear that effectiveness does not hinge on one factor alone, but it is a function of various usage patterns of several factors. More importantly, the usage patterns of mobile devices are greatly affected by their usage patterns. This significantly affects their engagement that involves behavioral, cognitive, and emotional engagements. The most influential pattern was cognitive engagement implying that the usage of mobile devices is crucial in shaping students' intellectual engagement.

The study helps demonstrate the relevance and significance of creating mobile usages that will be purposeful and academic while reducing distraction as much as possible. In addition to that, the study adds value to the ongoing discourse of mobile learning through contributions that are useful for the current scenario and can also be used in all universities in Nigeria and other institutions similar to these universities.

Recommendations

Given the findings presented above, the research recommends the following strategies towards the effective use of mobile devices:

1. Students in university libraries must be encouraged to use electronic resources, research databases, and other apps for learning.
2. Digital Literacy Training: Academic libraries ought to conduct training among the students in order to enhance their ability to efficiently utilize their mobile gadgets in academic work. There is need for them to create a balance between

productive and non-productive utilization of gadgets.

3. Guidelines, Not Bans: Academic libraries ought to create effective guidelines like the creation of study zones and quiet zones to ensure that the users concentrate while using the gadgets as opposed to placing bans on the use of the gadgets.
4. Time Management Training: It will be beneficial to assist the learners in the development of time management skills such that they can control the amount of time they spend on gadgets that are not useful for their academic work.
5. User-friendly Services: Academic libraries should enhance access to library services via mobile applications that are easy to use.
6. Use holistic approaches for engagement: Librarians need to ensure that they approach and engage methods that can be used to foster behavioral, cognitive, and emotional engagement. Such approaches may include tools for interaction, collaborative spaces, and services designed for students.

Overall, these recommendations are not about restriction but using mobile devices effectively to enhance academic engagement.

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