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COMPARATIVE ANALYSIS OF STUDENT ENGAGEMENT AND COMPREHENSION IN ONLINE LEARNING PLATFORMS: A MEASUREMENT AND EVALUATION APPROACH.

***Owor Effiom Owor, PhD, Uba James Uba, PhD, Runyi E. Francis, Ubi Samuel Ibor, PhD**
Corresponding email: **oworeffim@gmail.com*

Abstract
The present paper assessed student engagement and comprehension in online learning platforms among undergraduate and postgraduate students in Nigerian tertiary institutions. The study explores the impact of students' online engagement on learning outcomes, focusing on behavioral, emotional, and cognitive engagement. Utilizing a cross-sectional survey design, data were collected from 93 undergraduates and 66 postgraduates, highlighting a balanced gender distribution and age range of 21 to 47. Participants completed measures of online engagement and learning comprehension. The analysis revealed the positive effects of online engagement on academic comprehension, with varying degrees of influence between undergraduate and postgraduate students. Notably, cognitive engagement had a greater impact on academic comprehension for postgraduate students, while behavioral engagement showed a more significant effect for undergraduates. The findings underscore the importance of tailoring online learning strategies to enhance student engagement and ultimately improve learning outcomes. While the study has limitations in terms of generalizability, its insights contribute to the literature on comparing engagement and comprehension in online learning environments.

Keywords: Online Learning, Undergraduates, Postgraduate, Engagement, Comprehension.

Introduction
Education fosters critical thinking, creativity, and problem-solving skills, which are vital in addressing complex challenges in the modern world. In essence, education is the key to unlocking human potential and driving progress in any society (Chankseliani et al., 2021; Udofia & Gberevbie, 2019; Vorontsova et al., 2020), including socio-economic empowerment and poverty reduction (Ubogu & Veronica, 2018). It is an inevitable aspect for any country (Sriyakul et al., 2020). The concept of sustainable national development and its relationship with education has attracted research attention for many years (Boyi, 2013; Nwogu, 2013; Ugbogbo et al., 2013). Undoubtedly, education has allowed nations to attain their desired objective. Hence, education remains part of the developmental goals of every country.

Africa has seen a rise in the need for education (Kabir & Kadage, 2017). Perhaps the most common way to give education in underdeveloped nations, such as Nigeria, has been through traditional in-person instruction in a school setting where students and teachers engage physically (Ajadi et al., 2008; Oyeleke et al., 2015). The traditional teaching approach limits the learner's learning potential and creates information gaps by placing the responsibility for

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fostering learning on the teacher (Osinubi, 2014). However, over the past few decades, a growing commitment has been made to modernize Nigeria's educational system (Adewumi et al., 2012; Irele, 2021). However, the lack of appropriate digital learning and knowledge preservation tools causes the educational system many difficulties in fully integrating students (Gumel et al., 2019). Recognizing the value of digital education in giving students access to the most recent information has pushed governments and educational institutions to embrace digital learning strategies that offer greater flexibility and personalization in the learning process. Perhaps the lack of appropriate digital learning and knowledge preservation tools has made it difficult for the traditional paradigm to keep everyone on the same page.

Recent years have witnessed global trends in technological advancement that have led to innovations in educational paradigms (Zhang et al., 2020). Technology offers a feasible substitute for in-person or traditional educational methods in schools (Ebelogu et al., 2021). The swift advancement of the internet and wireless communication technologies has led to the emergence of diverse interactive multimedia networks and educational applications, including virtual classrooms, instant messaging, and web-based learning. Online learning refers to education that can occur efficiently and effectively without a traditional classroom setting. Online education has transformed learning in numerous ways (Mulenga & Marbán, 2020). Consequently, the construct pertains to integrating digital media into the learning process. Anttila et al. (2012) characterized digital learning as a mechanism to enhance digital instructional resources for online learning activities (Hockly, 2012). While digital learning cannot replace traditional instruction, it offers superior educational outcomes and enhanced comprehension.
Computing devices have emerged as the primary catalyst for instructional delivery in contemporary education in Nigeria (Oguzor, 2011). Research indicates that the utilization of computer devices and various digital innovations, such as computer games, android applications, podcasts, blogs, wikis, e-learning tools, and other educational technologies, is essential in influencing learner performance and enhancing engagement in schoolwork (Al-Jaberi, 2018; Alam et al., 2021; Franklin & Nahari, 2018; Mohammadyari & Singh, 2015; Moon & Ke, 2020; Mulqueeny et al., 2015; Owino, 2010; Ramdani et al., 2021; Rasheed et al., 2020; Shahabadi & Uplane, 2015; Suresh et al., 2018; Yang et al., 2021; Zahir et al., 2018; Zulkiply & Aziz, 2019). This is especially significant as the world is swiftly evolving into a technology-driven society, with the workplace increasingly recognizing the importance of digital knowledge and skills.

The relationship between digital learning and performance outcomes has been the subject of empirical research. For example, Zwart et al. (2020) investigated how digital learning materials (DLMs) affected nursing students' understanding of mathematics. Students receiving DLM instruction showed a significant improvement in their mathematical learning, according to the study's pre-test/post-test control group design. Chen (2017) used 326 students from Taiwanese institutions as research participants to examine how digital game-based instruction affected students' motivation and performance in learning. The researcher discovered that learning achievement was positively impacted by game-based training. Little (2015) used 34 students enrolled in rural public schools to investigate how digital game-based learning affected academic achievement and student engagement. An experimental pretest-posttest design with switching replications was used in the investigation. As a result, the researcher found that the digital game had the same impact on teachers' reported student involvement and academic accomplishment as the lab exercise.

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According to other research, the trend is beneficial for enhancing social skills (McNaughton et al., 2018), corporate ethics (Magrizos, 2020), thinking style (Liu & Hsueh, 2016), and communication abilities (Kyaw et al., 2019). Digital learning is crucial for lowering students' anxiety levels and raising their academic performance (Thongkoo, 2019). On the other hand, studies show that the widespread use of digital technology in classrooms has created digital distractions among students in recent years (Awofala et al., 2020; Gök, 2015), which may indicate that digital learning is lowering academic motivation and attitude.

Student engagement is a multifaceted concept encompassing student interest, curiosity, and involvement in their learning and school activities. It plays a crucial role in academic success and overall student well-being. Students actively engaged in their online courses tend to show higher levels of comprehension. Engagement fosters a deeper connection with the material, making it easier to understand and retain information. Features like discussion forums, live Q&A sessions, and interactive activities encourage students to participate actively, leading to a better grasp of concepts. The present study's primary purpose is to explore the difference between undergraduates' and postgraduate's online engagement (behavioral, emotional, and cognitive engagement) and learning comprehension.

Hypothesis

There will be a difference in learning comprehension between undergraduates and postgraduates regarding online engagement.

Method

The present research utilized a cross-sectional survey design to gather data from undergraduate and postgraduate students in three public tertiary institutions in Cross River State, Nigeria. The sample consisted of 93 undergraduate students and 66 postgraduate students. Moreover, the choice of public tertiary institutions in Cross River State as the study setting was deliberate. These institutions were selected due to their diverse student populations and academic offerings, which provided a rich data source for the research. By including multiple institutions, the study sought to enhance the generalizability of its findings and ensure that the results accurately reflected the broader student community in the region. When examining the gender distribution among the participants, it was found that 56.48% were females, while 43.52% were males, showcasing a relatively balanced representation of both sexes. The age range of the respondents varied from 21 to 47 years old. The study was carried out over a period spanning from July to October 2024. The research design, sample characteristics, and data collection period were carefully chosen to facilitate a comprehensive analysis of the undergraduate and postgraduate student population in Cross River State.

Measure

The participants in the study were required to complete a self-report measure focusing on online engagement across various domains. This measure aimed to evaluate three key aspects: behavioral engagement (BE), emotional engagement (EE), and cognitive engagement (CE) in the online learning environment. To assess behavioral engagement, a 10-point scale was utilized to gauge students' active participation in online learning activities. For emotional engagement, researchers employed a set of 6 items to measure students' motivation levels toward online

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learning. On the other hand, cognitive engagement was determined through a set of three items that delved into the cognitive dimensions of students' online learning experiences.

Moreover, researchers also designed five items geared explicitly towards measuring the participants' level of learning comprehension. A pilot study was conducted to ensure the reliability of the measurement scale. The analysis of Cronbach's alpha coefficients indicated that the internal consistency reliabilities of the instrument were at acceptable levels. These reliability levels surpassed the recommended cutoff threshold of .70, as suggested for research purposes by Kaplan and Saccuzzo (2013). This highlights the robustness of the measurement tool used in the study, underscoring the validity of the findings obtained through assessing online engagement across the behavioral, emotional, and cognitive domains. The meticulous attention to detail in designing and validating the measurement tools ensures that the study results are reliable and can be confidently interpreted in online learning engagement.

Result

The results of the linear regression analysis conducted to analyze whether the student's engagement in online learning predicted academic comprehension are presented in Tables 1 and 2.

Table 1 shows students' engagement in online learning and learning comprehension among undergraduates.

Undergraduates (N = 93)

Variable	B	SEB	β	t	F	R2	
BE	4.98	0.11	0.44	11.14	58.29		0.54
EE	3.72	0.09	0.35	7.78	38.90		0.31
CE	2.02	0.10	0.22	3.25	18.14		0.16

Table 2 shows students' engagement in online learning and learning comprehension among postgraduates.

Postgraduates (N = 66)

Variable	B	SEB	β	t	F	R2	
BE	4.24	0.11	0.37	8.11	51.29		0.35
EE	3.33	0.09	0.30	6.12	34.73	0.30	
CE	3.94	0.10	0.34	7.73	41.29	0.34	

Note. BE Behavioral Engagement; EE = Emotional Engagement; CE Cognitive Engagement; B = Unstandardized regression coefficient; SEB = Standardized error of the coefficient; β = Standardized coefficient; R^2 = Coefficient of determination. *P<.000.

The results of the linear regression analysis conducted to analyze whether the students' engagement in online learning predicted academic comprehension are presented in Table 1 and Table 2. Table 1 details the relationship between students' engagement in online learning and learning comprehension among undergraduates. For instance, it shows that Behavioral Engagement (BE) significantly impacts learning comprehension, with a beta coefficient of 0.44, indicating a strong positive relationship. This means that students who are more behaviorally engaged in online learning tend to have higher levels of academic comprehension. Moving on to

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Table 2, the focus shifts to postgraduates and their engagement in online learning. Here, we see that Emotional Engagement (EE) and Cognitive Engagement (CE) also play significant roles in predicting learning comprehension among postgraduate students. For example, the standardized coefficients for EE and CE are 0.30 and 0.34, respectively, suggesting that emotional and cognitive engagement are essential for postgraduates' academic success. Interestingly, while there are similarities in the impact of engagement on learning comprehension between undergraduates and postgraduates, there are also some differences. These differences could be due to varying academic demands, levels of motivation, or learning styles between the two groups. Overall, the findings from both tables underscore the importance of student engagement in online learning as a predictor of academic success, highlighting the need for educators to promote and support different forms of engagement to enhance learning outcomes.

Discussion

This research paper delves into the detailed examination and assessment of student engagement and comprehension within online learning platforms. The study's results shed light on how students' active participation in online activities correlates positively with their academic performance and understanding of the course material. For instance, the data revealed a significant impact of student engagement on their scores, with beta values ranging from 0.22 to 0.44 and t-values ranging from 3.25 to 11.14. Moreover, a clear distinction emerged between the outcomes of undergraduate and postgraduate students. Notably, the analysis showed that a substantial portion of the academic outcome's variance among postgraduate students, amounting to 38%, could be elucidated by their cognitive engagement scores, denoted by an R-squared value of 0.34. Conversely, only 18% of the variance in academic outcomes for undergraduate students could be attributed to cognitive engagement, indicating a lesser influence than postgraduates.

Expanding on this, it becomes evident that cognitive engagement is more pivotal in enhancing postgraduate students' academic comprehension. On the other hand, behavioral engagement was found to have a more pronounced impact on academic outcomes for undergraduate students, with 59% of the total variance in their academic scores being explained by behavioral engagement, as reflected in an R-squared value of 0.54. In contrast, postgraduate students exhibited a lower dependency on behavioral engagement, with only 38% of the academic outcome's variance explicable by their behavioral engagement scores ($R2 = 0.35$). The research underscores the nuanced interplay between student engagement, academic performance, and educational level, highlighting the differential effects of cognitive and behavioral engagement on undergraduate and postgraduate students' learning outcomes within online learning environments.

Conclusion

The current study's findings hold significant implications for educators when tasked with implementing online learning platforms. By comparing the various factors that influence the fundamental moderating factors, educators are provided with a solid foundation for crafting the learning environment, devising effective learning strategies, organizing lectures, and selecting appropriate assessment methods. These elements collectively enhance the effectiveness of students' comprehension in online learning settings. For instance, when considering the impact of behavioral engagement on academic outcomes, it becomes evident that students at lower educational levels benefit significantly from increased motivation in online learning. This can be

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achieved by incorporating interactive technologies, creating engaging learning activities like virtual games, and providing personalized feedback to encourage active participation. It is important to acknowledge the limitations of this study, such as the fact that participants were drawn from a restricted context, which may hinder the generalizability of the findings. Despite this, the research contributes significantly to the existing literature by underscoring the importance of comparing students' engagement levels and comprehension abilities within online learning platforms. This highlights the need for further exploration and research to continually improve online education practices and outcomes.

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