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THE IMPACT OF ONLINE LEARNING PLATFORMS ON UNDERGRADUATE STUDENTS' ACADEMIC ACHIEVEMENT IN COMPUTER SCIENCE EDUCATION: A COMPREHENSIVE STUDY OF PUBLIC AND PRIVATE UNIVERSITIES IN ANAMBRA STATE, NIGERIA

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ABSTRACT

The current research investigated students' perceptions of the role of online learning platforms in supporting undergraduate academic achievement in Computer Science Education in public and private universities in Anambra State, Nigeria. The research applied descriptive survey design and census sampling technique involving 412 students (200-400 levels) from three universities: Nnamdi Azikiwe University, Chukwuemeka Odumegwu Ojukwu University, and Madonna University Okija. Data were produced through the administration of a structured questionnaire with return rate of 97% (400 valid responses). Findings indicated that the students disagreed strongly that online learning platforms improved their academic performance (general mean = 1.68) except for general positive impact on general academic performance (mean = 2.75). Statistical calculations revealed no perceptual difference between private and public university students (p = 0.922) and male and female students (p = 0.946). The research proved the existence of paradoxical relationships where the students attested to broad-based benefit but doubted specific learning advantage. The research recommends an establishment of holistic technological infrastructure, curriculum-based integration of digital learning, faculty capacity development through digital pedagogy workshops, development of context-specific digital resources sensitive to the Nigerian education system, and the institution of systematic evaluation schema to ensure improvement. Such responses have the potential of reversing hitherto sceptical perceptions to more positive learning processes and outcomes in Computer Science Education.

Keywords: Online learning platforms, Academic achievement, Computer Science Education, Higher education in Nigeria, Gender differences in e-learning

Introduction

The adoption of e-learning platforms has been a revolutionary approach in the tertiary education industry, particularly in technology fields like Computer Science Education. For Nigerian Anambra State, tertiary institutions are embracing online learning platforms to enhance education services and students' performance (Anike, 2024). Yet, the adoption of these online learning platforms also varies extensively by types of education institutions, leading to a complex scenario of technology adoption and academic performance (Daud *et al.,* 2022).

E-learning platforms are internet-based systems that are designed to facilitate teaching and learning in online environments (Thakkar & Joshi, 2015). These systems possess different features including multimedia materials, interactive practice, testing software, as well as progress monitoring features (Crow *et al.,* 2018). In Computer Science Education, these systems offer critical tools including video lectures, coding practice, virtual labs, as well as interactive tutorials that supplement classroom face-to-face teaching (Davis *et al.,* 2008). The Anambra State university system, both public and private universities, offers a fascinating context to examine the impact of e-learning platforms on the performance of undergraduate students (Akudolu *et al.,* 2017). Public universities like Nnamdi Azikiwe University and Chukwuemeka Odumegwu Ojukwu University, and private universities like Madonna University Okija and University on the Niger, have varying e-learning adoption models, which reflect varying technological infrastructure, resource investment, and pedagogy (Allo *et al.,* 2022).

Literature supports that student success in computer science can be influenced significantly by learning environments that exist online. Chen *et al.* (2018) conducted a meta-analysis reporting a correlation between the use of online learning environments and academic success in computer science. Current research has concluded active use of content online by students results in more academic success than students that utilized only conventional instructional methods (Neema-Abooki & Alfred, 2014). Being able to use course materials anytime, give feedback right away and being able to work on one's own timeline appear to be of distinct worth in the technical field of computer science (Jain *et al.,* 2024). The efficacy of these learning environments does not, however, distribute equally to groups of students. Institution level, availability of technology and learning style are just a few mediators of online learning environments' success (McCann, 2006).

This study aims to extensively investigate how internet learning platforms influence the academic achievement of undergraduate Computer Science Education students in different kinds of universities in Anambra State. Through the investigation of the difference between public and private universities, the study aims to acquire in-depth understanding of the potential of digital learning platforms in enhancing academic achievement in a changing technological learning environment. Beyond academic curiosity, the significance of this study extends beyond academic interest. Understanding the impact of online learning platforms has the potential to inform institutional policy, inform investment in technology and ultimately lead to enhancing the delivery of computer science education.

Purpose of the Study

The purpose of the study was to investigate the perceived impact of online learning platforms on university undergraduate students' academic achievement in Computer Science Education Courses in Anambra State. Specifically, the study sought to investigate the;

1. Impact of online learning platforms on undergraduate students'

academic achievement in Computer Science Education Courses in public and private universities in Anambra state.

2. Impact of online learning platforms on university male and female undergraduate students' academic achievement in Computer Science Education Courses in Anambra state.

Research Questions

1. What is the perceived impact of online learning platforms on public and private university undergraduate students' academic achievement in Computer Science Education Courses in Anambra state?
2. How does the impact of online learning platforms on achievement in Computer Science Education Courses differ between male and female university undergraduate students in Anambra state?

Hypotheses

$H0_1$: There is no significant difference in the perceived impact of online learning platforms on undergraduate students' achievement in Computer Science Education Courses in public and private universities in Anambra state.

$H0_2$: There is no significant difference in the impact of online learning platforms on male and female university undergraduate students' achievement in Computer Science Education Courses in Anambra state.

Methods

This study employed descriptive survey research design to examine the impact of online learning platforms on learning outcomes of undergraduate students of Computer Science Education in public and private universities in Anambra State, Nigeria. The focal point of the study was three universities: Nnamdi Azikiwe University (federal/public), Chukwuemeka Odumegwu Ojukwu University (state/public), and Madonna University Okija (private). The population was 412 undergraduate students (200-400 levels) of Computer Science Education courses in the 2023/2024 academic year. A census sampling approach was adopted, omitting 100-level students since they had not gained sufficient experience in the use of both conventional and online learning platforms to offer relevant comparative information. Data collection employed a structured questionnaire instrument titled "Impact of Online Learning Platforms on University Undergraduates Learning Outcomes in Computer Science Education Courses" (OLPULOC) adapted and modified from Nworgu (2013) and Luo (2019). The instrument employed a four-point Likert scale (4=Strongly Agree to 1=Strongly Disagree) and was very reliable with a total Cronbach's alpha coefficient of 0.81 (Achievement cluster: 0.87). On-site administration and collection yielded 400 usable responses (97% return rate). Weighted means and standard deviations employed in data analysis to respond to research questions, while hypotheses testing employed Independent Samples t-test at 0.05 significance level to determine public and private university differences using SPSS version 25.

Results

Research Question 1: What is the perceived impact of online learning platforms on public and private university undergraduate students' academic achievement in Computer Science Education Courses in Anambra state?

Table 1: Perceived Impact of Online Learning Platforms on Academic Achievement by University Type

Item	Statement	Public Universities (n=290)		Private Universities (n=110)		Overall (n=400)		Decision
		Mean	SD	Mean	SD	Mean	SD	
1	Access to learning materials enhances achievement	1.56	0.77	1.61	0.79	1.58	0.77	Disagree
2	Positively influenced overall academic performance	2.75	0.62	2.75	0.64	2.75	0.62	Agree
3	Grades improved from online resources	1.46	0.69	1.44	0.63	1.45	0.67	Disagree
4	Provided valuable insights for academic success	1.54	0.59	1.57	0.58	1.55	0.59	Disagree
5	Enhanced understanding of Computer Science concepts	1.54	0.78	1.56	0.77	1.55	0.77	Disagree
	Overall Mean	1.68	0.38	1.69	0.39	1.68	0.38	Disagree

Note: Mean scores based on 4-point scale (4=Strongly Agree, 3=Agree, 2=Disagree, 1=Strongly Disagree). Mean below 2.50 indicates disagreement.

Table 1 shows that undergraduate students in private and public universities in Anambra State disagree that online learning platforms have a positive impact on their academic performance in Computer Science Education (overall mean = 1.68, below the 2.50 agreement point). There was agreement on just one item alone: "The use of online learning platforms has positively influenced my overall academic performance" (mean = 2.75). Students did not agree, however, with more specific claims of greater understanding of concepts (mean = 1.55), better grades (mean = 1.45), and exposure to useful learning materials (mean = 1.58). This suggests a complex relationship where students agree on overall benefits but are not sure about specific academic benefits from online learning platforms.

Research Question 2: How does the impact of online learning platforms on achievement in Computer Science Education Courses differ between male and female university undergraduate students in Anambra state?

Table 2: Perceived Impact of Online Learning Platforms on Academic Achievement by Gender

Item	Statement	Male Students (n=192)		Female Students (n=208)		Decision
		Mean	SD	Mean	SD	
1	Access to learning materials enhances achievement	1.44	0.64	1.70	0.86	Disagree
2	Positively influenced overall academic performance	2.58	0.55	2.90	0.65	Agree
3	Grades improved from online resources	1.48	0.77	1.42	0.57	Disagree
4	Provided valuable insights for academic success	1.50	0.58	1.60	0.60	Disagree
5	Enhanced understanding of Computer Science concepts	1.66	0.90	1.45	0.62	Disagree

Note: Mean scores based on 4-point scale (4=Strongly Agree, 3=Agree, 2=Disagree, 1=Strongly Disagree). Mean below 2.50 indicates disagreement.

Table 2 shows that male and female undergraduate students share the same perception of the impact of online learning platforms on their academic performance, with both having the same grand mean score of 1.68, showing disagreement. While both genders were in agreement that online platforms had a positive impact on their overall academic performance (male mean = 2.58, female mean = 2.90), they did not agree on other specific impacts. Female students actually had greater agreement on the overall positive impact (mean = 2.90) compared to male students (mean = 2.58), but this difference was not significant enough to change the overall perception, suggesting that gender is not a significant factor in the manner in which students perceive the academic impacts of online learning platforms.

Hypotheses

$H0_1$ There is no significant difference in the perceived impact of online learning platforms on undergraduate students' achievement in Computer Science Education Courses in public and private universities in Anambra state.

Table 3: t-Test of Significant Difference Between Public and Private University Students

School Type	N	Mean	SD	df	t	p-value	Decision
Public	290	1.68	0.38	398	0.098	0.922	Not Significant
Private	110	1.69	0.39				

Table 3 presents the t-test outcome for perceptions among public university students and private university students regarding the impact of online learning platforms. With mean scores of 1.68 for public university students and 1.69 for private university students, the outcome of the t-test was t-value = 0.098 and p-value =

0.922, which is far above the 0.05 significance level. This statistical truth confirms the null hypothesis ($H0_1$) that there is no significant difference ($p > 0.05$) in the manner in which public university students and private university students perceive the impacts of online learning platforms on their performance in Computer Science Education, and that institution type has no influence on students' perceptions.

$H0_2$ There is no significant difference in the impact of online learning platforms on male and female university undergraduate students' achievement in Computer Science Education Courses in Anambra state.

Table 4: t-Test of Significant Difference Between Male and Female University Students

Gender	N	Mean	SD	df	t	p-value	Decision
Male	192	1.68	0.44	398	0.068	0.946	Not Significant
Female	208	1.68	0.32				

Table 4 depicts t-test of male and female students' opinion about the effect of online learning platforms on their academic performance. With identical mean score of 1.68 for both males and females but with different standard deviations (male SD = 0.44, female SD = 0.32), the t-test provided a t-value of 0.068 and a p-value of 0.946, significantly larger than the 0.05 significance value. This result supports the null hypothesis ($H0_2$) of no significant difference in male and female students' opinions regarding the effect of online learning platforms on their performance in Computer Science Education courses, i.e., gender does not matter in the perception of the academic utility of such platforms.

Discussion

The outcome of this research indicates a complex and somewhat contradictory relationship between the e-learning platforms and the academic achievement of Anambra State, Nigeria, undergraduate students of Computer Science Education. Despite the fact that the world is now adopting online learning, the outcome reflects a generally unfavourable perception by the students of the impact of the e-learning platforms on their academic achievement, regardless of university category or sex. The overall dissent with items indicating positive impacts of online learning platforms (mean = 1.68) goes against some previous studies that have reported positive impacts. For instance, Alshammary & Alhalafawy (2023) found a positive correlation between the use of online platforms and student computer science academic performance. The difference may be contextual in nature, unique to Anambra State, for instance, limitations in technological infrastructures was cited by Okoroma (2018) as universal issues in Nigerian universities. As Abera *et al.* (2023) propose, the effectiveness of digital learning technologies depends very much on institutional readiness and support infrastructures, which may be underdeveloped in the universities of the study.

Interestingly, the students agreed that online learning platforms contributed positively to their overall academic achievement (mean = 2.75), but they did not agree with more specific statements of

improved grades, improved comprehension, or shedding light on learning. This apparent inconsistency is in agreement with Abera *et al.* (2023) that students may be able to accept overall benefits but not see particular academic improvement. The discrepancy between perceived overall improvement and particular academic achievements is indicative of the possibility that students can accept online platforms as auxiliary tools for learning but not as traditional learning tools. The absence of significant differences between private and public universities ($p = 0.922$) is contrary to the general supposition that private universities would be positioned to achieve higher technological integration due to potentially superior resources. This finding supports Allo *et al.*'s (2022) observation that across Anambra State, private and public universities share identical issues in properly executing digital learning programs. The same perceptions across university type demonstrate that structural issues in the application of online learning transcend university categorization and potentially are more fundamental in overall education ecosystem issues.

Similarly, the lack of significant perception difference between male and female students ($p = 0.946$) refutes findings in previous literature that support gender differences in technology adoption. For example, Chang *et al.* (2024) found that there were differences in the use of online materials, with higher technological self-efficacy being exhibited by male students. The study's finding here shows that in the case of computer science education in Anambra State, gender hardly influences students' experience or benefit from online resources. This may be a sign of increased efforts in closing digital gender gaps or a sign that dynamics based on discipline are present in computer science education that erase anticipated gender gaps.

The low scores on most of the items indicate a range of potential causes. First, as Akaeze & Akaeze (2024) explained, the effectiveness of online learning platforms depends on a range of variables including internet connectivity, power supply stability, and device access—reported issues in developing contexts like Nigeria. Second, there could be a mismatch between online resources and learning outcomes in the curriculum, as Alfauzan & Tarchouna (2017) emphasized the importance of alignment for effective learning outcomes. Third, learners might lack adequate digital literacy skills to be able to fully utilize available online resources, an issue Erwin & Mohammed (2022) reported in computer science education alone.

These findings have significant implications for Anambra State higher education stakeholders. For university administrators, they highlight the need to invest in technological infrastructure and train staff to be able to integrate online learning platforms into computer science courses without having to struggle. For instructors, the findings suggest the merit of making explicit connections between online materials and learning outcomes and assessment measures. For policymakers, they suggest the need to address systemic barriers to successful digital education uptake.

Conclusion

This study explored the perceived effect of online learning platforms on undergraduate students of Computer Science Education's academic performance in Anambra State, Nigeria's public and private universities. The results of the study indicate that students do not, on average, perceive online learning platforms to have a positive effect on their academic performance, regardless of the institution type or gender. Despite admitting some overall positive effect on academic performance generally, students were not sure of some benefits like improved grades, improved understanding of concepts, or perceptive knowledge in academics. That there are no significant differences between public and private university students and between males and females, indicates that problems and challenges of Computer Science Education on online learning platforms transcend institutional and demographic boundaries in this setting. This means that systemic issues - perhaps technology infrastructure gaps, pedagogical mismatch, and digital literacy gaps may be affecting the effectiveness of online learning platforms for both groups of students in Anambra State.

Recommendations

Based on the findings, the following is recommended:

1. Anambra State universities concentrate on infrastructural development by investing in secure internet and computer laboratories.
2. Computer Science Education courses formally integrate online learning materials into curricular design, making conscious connections between online content and learning outcomes.
3. Institutions integrate digital literacy elements so that students learn how to use online resources optimally.
4. A blended learning approach be adopted, with a deliberate combination of face-to-face instruction and technology-enabled learning rather than online learning as a replacement for face-to-face instruction.
5. Schools require public-private collaborations with tech companies to advance technological infrastructure and access to high-quality online educational platforms.

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