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A Comparative Analysis Of Student Performance In Online And Physical Lectures For Students In Higher Education Case Study Of Katsina State

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ABSTRACT
This study explores the comparative effectiveness of online and physical lecture formats in higher education, focusing on student performance in Katsina State. With the increasing shift towards online learning, especially accelerated by the COVID-19 pandemic and the need for adaptive education in the face of regional insecurity, understanding how these modes affect learning outcomes is critical. This research evaluates engagement levels, academic performance, and student satisfaction between online and in-person lectures across universities and colleges in Katsina. A quantitative analysis using chi-square tests and regression models on data from 250 students reveals that while online education offers flexibility and accessibility, students generally perform better in traditional classroom settings due to direct interactions with instructors and peers. However, specific demographic and individual factors, including gender and program of study, influence students' preferences and success in each mode. The study concludes with recommendations to optimize both learning formats, suggesting a hybrid model to leverage the strengths of each approach. This research contributes valuable insights into the evolving landscape of education in Katsina State, providing a basis for policies aimed at enhancing student learning experiences in higher education.
Keywords: Performances, Lectures, Students, Higher Education

1.0 INTRODUCTION

In recent years, the landscape of higher education has witnessed a significant transformation with the proliferation of online learning platforms and the increasing integration of technology into traditional classroom settings. This shift has prompted educators and researchers alike to explore the effectiveness of different instructional modalities in fostering student learning and academic success. One area of particular interest is the comparative analysis of student performance between online and physical lecture formats. Computer-assisted instruction is reshaping the educational landscape, with an increasing number of students turning to online education. Colleges and universities are emphasizing the advantages of web-based learning and swiftly integrating online classes to cater to the global student population. According to a study by Lundberg et al. (2008), universities have

witnessed a dramatic surge in the offering of online courses in recent years. Think tanks, too, are disseminating data on web-based instruction, with statistics from the Sloan Consortium indicating a 17% increase in online students in 2010 compared to previous years, surpassing the 12% increase recorded in the preceding year (Keramidas, 2012). Contrary to common perception, online education is not a new phenomenon. The roots of correspondence and distance learning programs can be traced back to the mid-1800s, pioneered by the University of London. Although initially reliant on postal services, the concept gained traction in the United States later in the nineteenth century. The establishment of the "Society to Encourage Home Studies" in Boston, Massachusetts, in 1873 marked the inception of what would evolve into a more robust online instructional modality today. Technological advancements have played a pivotal role in enhancing the speed and accessibility of distance learning, enabling students worldwide to participate in classes from the convenience of their homes. In teacher-centered, or passive learning, the classroom dynamics are typically controlled by the instructor. The teacher delivers lectures and offers commentary while students listen, take notes, and pose questions. Conversely, in student-centered, or active learning, students play a more active role in shaping classroom dynamics. They independently analyze information, formulate questions, and seek clarification from the instructor. In this scenario, it's the teacher who assumes the role of listener, formulator, and responder (Salcedo, 2010). Despite the widespread advocacy for online education, questions persist regarding its effectiveness. Researchers continue to explore the efficacy of computer-assisted teaching, considering factors such as cost-benefit analysis, student experience, and performance when assessing whether online education can serve as a viable alternative to traditional classroom instruction. This deliberation is likely to extend into the future as technological advancements progress and student expectations evolve. As Driscoll et al. (2012) note, the literature on the effectiveness of online courses is extensive and polarized. Some studies favor traditional classroom instruction, citing concerns such as higher dropout rates among online learners and a perceived lack of feedback for both students and instructors (Atchley et al., 2013). These limitations can compromise student retention, satisfaction, and performance. However, proponents of distance learning argue that online education can yield outcomes comparable to or better than traditional classroom settings (Westhuis et al., 2006).

1.1 Integrating Constructivism and Subject-Specific Pedagogy in Online and In-Person Education

In the field of education, subject-specific pedagogy plays a crucial role in recognizing the unique characteristics of various academic disciplines (Shulman, 1986). This perspective suggests that teaching strategies should be tailored to fit the specific needs of each subject, acknowledging that disciplines like mathematics, literature, and science require different approaches to facilitate effective learning (Shulman, 1987). Subject-specific pedagogy emphasizes that instructional methods should reflect how experts in a particular field think, reason, and engage with their subject matter (Cochran-Smith and Zeichner, 2005). When designing instruction for both online and in-person learning environments, the need to adapt teaching methods becomes even more critical. Online learning often demands unique strategies due to its reliance on technology, asynchronous communication, and the potential for diminished social presence (Anderson, 2003), while in-person learning benefits from direct interaction and immediate feedback (Allen and Seaman, 2016). The combination of constructivism and subject-specific pedagogy highlights this need for adaptability. In online education, constructivist principles can be supported by creating interactive activities that promote exploration, reflection, and collaborative learning (Salmon, 2000). Tools like discussion forums, virtual labs, and multimedia presentations offer students opportunities to actively engage with the content (Harasim, 2017). By incorporating subject-specific pedagogy, educators can craft online lessons that reflect the methodologies of the discipline while utilizing technology to create authentic learning experiences (Koehler and Mishra, 2009). For example, an online history course might include virtual museum tours, analysis of primary sources, and collaborative timeline projects.

In traditional in-person classrooms, constructivist methods can be employed through group work, problem-solving exercises, and in-depth discussions that encourage active student involvement (Jonassen et al., 2003). Subject-specific pedagogy enhances these methods by ensuring that teaching strategies align with the natural features of the subject (Hattie, 2009). For instance, in a physics class, hands-on experiments and real-world applications can make abstract theories more tangible (Hake, 1998). Ultimately, the combination of constructivism and subject-specific pedagogy provides a flexible approach to instructional design that can be adapted to both online and in-person learning environments (Garrison, 2011). By applying the principles of both frameworks, educators can create teaching strategies that align with the specific demands of the subject and the learning environment, offering students engaging and effective learning experiences.

1.2 Challenges and Opportunities in the Rapid Expansion of Distance Learning in Higher Education

The swift growth of distance learning in higher education, especially accelerated by the COVID-19 pandemic (Volk et al., 2020; Bettinger et al., 2017), highlights the importance of alternative educational methods during times of crisis. Disruptions, such as the pandemic, have driven innovation and the adoption of distance learning as a vital contingency strategy (Christensen et al., 2015). Institutions like King Saud University, along with others globally, were compelled to transition swiftly to online education to continue their operations. E-learning has become increasingly prominent in higher education due to advancements in technology, offering universities a competitive advantage (Valverde-Berrocoso et al., 2020). During crises like the COVID-19 pandemic, digital communication emerged as an effective means to overcome barriers and enhance educational interactions worldwide (Bozkurt, 2019). Distance learning, characterized by its flexibility, became essential when traditional in-person instruction was disrupted by unforeseen events, such as the pandemic (Arkorful and Abaidoo, 2015). It allows students to study at their own pace, a practice known as self-directed learning (Hiemstra, 1994) or self-education (Gadamer, 2001). Other benefits include increased accessibility, cost-effectiveness, and adaptability (Sadeghi, 2019).

Nevertheless, distance learning comes with its own set of challenges. Technical issues such as network instability, device limitations, and communication disruptions remain significant obstacles (Sadeghi, 2019). Additionally, concerns about distractions in the online learning environment, exacerbated by the prevalence of social media and the internet, have been raised (Hall et al., 2020; Ravizza et al., 2017). The lack of traditional in-person interactions between students and instructors is also seen as a potential drawback of online education (Sadeghi, 2019).

1.3 The Role and Evolution of Online Learning in Enhancing Educational Outcomes

Online learning has emerged as a contemporary method of teaching various educational components, including the development of reading and writing skills for both native and non-native English speakers. Many scholars define online learning as access to educational experiences through technology (Bataineh et al., 2016). It involves instructional environments supported by the internet, offering a wide range of programs that provide access to learning materials and facilitate interaction between teachers and students. This concept also relates to familiar notions such as online help, online documentation, and online services (Cavanaugh, 2017). The significance of online learning in education is vast, as it enables access to high-quality educational resources from around the globe, benefiting thousands of learners. In this context, understanding how to effectively utilize online learning to enhance learning processes in schools and colleges becomes critical. The Nigerian Federal Ministry of Education, as part of its efforts to fulfill the Sustainable Development Goals (SDG), launched an ICT-driven project known as School Net. This initiative aimed to equip all secondary schools in Nigeria with computers and internet access. Additionally, in collaboration with the National Communications Commission (NCC), the Ministry utilized the Universal Service Provision Fund (USPF) to sponsor the School Access Programme (SAP), providing computers and internet connectivity to select schools through various e-learning tools. Online learning refers to education that is delivered solely through the web, without any physical materials or face-to-face interactions. It is characterized by the exclusive use of e-learning tools, where the internet serves as the primary medium for all learning and communication (Linjawi & Alfada, 2018). With increasing internet access, e-learning is often equated with web-based learning (Hadad, 2013). This mode of learning can be implemented through self-paced independent study, asynchronous interactions (where learners

engage at different times), or synchronous sessions (where learners interact in real-time) (Trusov et al., 2017). Additionally, online learning has been shown to cater to various learning styles, which is a key factor in educational success (Trusov et al., 2017).

Although online learning, along with blended approaches that integrate online elements into traditional classes, is growing rapidly, it remains in its early stages of development. Therefore, developers and providers of online education must gain a deeper understanding of how students perceive and react to e-learning components, as student attitudes are essential to motivation and learning. Additionally, there is a need for strategies to apply online learning effectively to enhance educational outcomes (Johnston et al., 2015). This research aims to assess a comparative analysis of student performance in online and physical lectures for students in higher education case study of katsina state

1.4 A Comparative Examination of Student Performance in Online and In-Person Learning during the COVID-19 Pandemic

The year 2020 was an unprecedented period marked by the global disruptions caused by the COVID-19 pandemic. Governments and institutions across various sectors, including health, economy, and education, faced unforeseen challenges. To ensure the continuity of education, many institutions worldwide rapidly adopted distance learning, also referred to as e-learning, online learning, or virtual classrooms. However, despite the widespread shift to online education, a comprehensive analysis of its impact on student performance compared to traditional in-person learning remains largely underexplored. Research examining the outcomes of online learning has consistently shown that students in virtual classrooms tend to achieve less favorable results than those in traditional face-to-face settings (Fischer et al., 2020). Nevertheless, much of the existing research focuses on the potential impact of online learning (Kuhfeld et al., 2020) or explores various perspectives on distance education (Aucejo et al., 2020), often overlooking a detailed evaluation of its direct academic consequences, particularly in terms of test scores and grades. Given the limited research on the academic effects of online learning, especially in the context of the COVID-19 pandemic, this study seeks to address the gap by evaluating the effectiveness of distance learning compared to in-person instruction. The research focused on five required freshman-level courses at King Saud University, Saudi Arabia. It compared the final exam results of 8,297 first-year students who attended these courses in person in 2020 with those of 8,425 freshmen who took the same courses online in 2021. The courses under examination included University Skills 101, Entrepreneurship 101, Computer Skills 101, and Fitness and Health Culture 101. Factors such as gender, class size, and admission scores, known to correlate with student achievement (Meinck and Brese, 2019; Jepsen, 2015), were also considered. Furthermore, since the preparatory year at King Saud University is divided into five academic tracks health, nursing, science, business, and humanities the study offers insights into the comparative academic performance of students across these tracks.

1.5 A Comparative Analysis of Online vs. Face-to-Face Student Performance Flexibility and Efficiency in Education

Paul and Jefferson (2019) conducted a comprehensive study comparing student performance in online versus face-to-face environmental science courses over a seven-year period from 2009 to 2016. With the increasing shift toward online education, more students are opting for this flexible learning modality, finding traditional classroom environments restrictive and impractical. As technological advancements enable effective classroom instruction via the internet, educational institutions are re-evaluating how to deliver their content. The demand for quality programs that can be accessed anywhere and at any time is growing, especially among working professionals, stay-at-home parents, and others seeking flexibility. This growing appeal is further enhanced by the variety of programs available and the time efficiency offered by distance learning (Wladis et al., 2015).

Students increasingly seek educational options that allow them to balance their academic pursuits with professional and personal commitments. Instead of being confined to specific locations or times, online learning enables students to communicate with instructors, engage with peers, access study materials, and complete assignments from any internet-connected location (Richardson & Swan, 2003). This flexibility provides much-needed mobility and enhances the overall learning experience. According to Lundberg et al. (2008), online courses offer flexible study hours, allowing students with jobs to attend virtual classes by watching instructional films or streaming lecture videos after work.

This additional study time may lead to improved class performance, with more chapters covered, higher quality papers, and more collaborative group projects. Though research on the relationship between study time and performance remains limited, it is often assumed that online students use their extra time to boost their grades (Bigelow, 2009).

1.6 Research Questions

The following research question was made before commencing the research

1. what is the impact of online and physical lectures on student engagement in higher education?
2. What are the learning outcomes of students in online and physical lectures?
3. What are the factors influencing student performance in both online and physical lecture settings?
4. What are the possible recommendations for optimizing student learning experiences in online and physical lecture environment?

1.7 Objectives of the Study

The aim of research is to investigate and understand the differences, if any, in academic outcomes between these two modes of learning delivery through the following objectives:

i. To assess the impact of online and physical lectures on student engagement in higher education.
ii. To compare the learning outcomes of students in online and physical lectures
iii. To identify factors influencing student performance in both online and physical lecture settings
iv. To provide recommendations for optimizing student learning experiences in online and physical lecture environment.

2. RESEARCH METHOD

2.1 Study Area

Katsina State is located in the North-West geopolitical zone of Nigeria, along with neighboring states such as Jigawa, Kaduna, Kano, Kebbi, Sokoto, and Zamfara. Positioned about 487.9 km north of Abuja, the nation's capital, the state spans an area of 24,192 square kilometers. Katsina comprises 34 local government areas and is primarily inhabited by the Hausa and Fulani ethnic groups.

2.2 Data collection

Data was gathered through structured interviews and Questionnare Students in some selected higher education in Katsina state such as Hassan usman Katsina polytechnic, Federal college of education Katsina, Alqalam University Katsina and fedral University Dutsinma (both undergraduate and postgraduate), who have experienced both online and physical lecture settings are selected for the research. Aim for at least 200 students to ensure the robustness of the analysis. We chose students from different fields of study to capture a diverse perspective.

2.3 Statistical Analysis

The research employ statistical techniques Chi-Square analysis, For instance, we assess whether there is a statistically significant difference in engagement (measured by responses to questions on engagement) between students who predominantly attend online lectures and physical lectures. Regression analysis also help to identify which factors most influence performance in both online and physical lectures. With the us of statistical package for social sciences SPSS version 23.

3. RESULT AND DISCUSSION

This section presents a comprehensive analysis of the data collected in the study, focusing on student performance and preferences in online and physical lectures within higher education, the research seeks to identify significant patterns and trends, shedding light on how factors such as age, gender, program of study and academic level may influence students' learning preferences.

Table 1 Demographic data of the respondent

Age	**Frequency**	**Percent**
Below 18	15	6.0
18-25	140	56.0
26-35	75	30.0
Above 35	20	8.0
Total	250	100.0
Gender		
Male	200	80.0
Female	50	20.0
Total	250	100.0
Mode of Lecture Preference		
Physical Lectures	225	90.0
Both Equally	25	10.0
Total	250	100.0
Program Distribution		
Science	235	94.0
Engineering	15	6.0
Total	250	100.0
Academic Level Distribution		
Undergraduate	210	84.0
Postgraduate	40	16.0
Total	250	100.0

The age distribution of the respondents in the study reveals a diverse population, with a total sample size of 250 participants. A significant majority, comprising 56% (140 respondents), falls within the 18-25 age range, highlighting the dominance of young adults in this demographic, which is characteristic of many higher education institutions. This large proportion of younger students suggests that their perspectives and experiences are likely to play a crucial role in shaping the findings of the study. Following this, 30% of the respondents, or 75 individuals, belong to the 26-35 age group, indicating a noteworthy presence of individuals in their late twenties to early thirties who may be pursuing further education or transitioning into their professional careers. Meanwhile, 6% of respondents are below 18 years of age, amounting to 15 students, reflecting a small segment of early enrollees who may be taking advanced courses or participating in dual enrollment programs. Finally, the age group above 35 years accounts for 8% of the sample, with 20 respondents, which suggests that there are some older students engaging in higher education, likely due to career changes or personal interests in further learning. Overall, this age distribution underscores the youthful demographic prevalent in higher education, while also acknowledging the inclusion of mature students, thereby enriching the diversity of experiences and perspectives within the study's findings. The gender distribution among the respondents in the study illustrates a notable imbalance, with a total sample size of 250 participants. Of these, a substantial majority are male, comprising 80% (200 respondents) of the total population. This significant overrepresentation of male respondents indicates a prevailing trend within the sample, suggesting that males may dominate the particular field or institution being studied. Conversely, female respondents account for only 20% (50 respondents), highlighting a considerable gender disparity in the sample. This underrepresentation of female participants may reflect broader societal issues regarding gender access and participation in the relevant educational or professional context, which could impact the overall findings of the study. The stark contrast between the genders indicates that the insights and experiences captured may predominantly reflect the views of male respondents, thereby potentially limiting the applicability and inclusiveness of the study's conclusions. Overall, the gender distribution underscores a critical aspect of the demographic landscape, calling for further exploration of the factors contributing to the gender imbalance within the studied population. The data on mode of lecture preference among the respondents reveals a strong inclination towards traditional classroom instruction. Out of a total of 250 participants, an overwhelming majority, representing 90% (225 respondents), expressed a preference for physical lectures. This preference highlights the significance that students place on in-person learning experiences, which are often associated with enhanced engagement, direct interaction with instructors, and collaborative opportunities with peers. The findings suggest that many students value the traditional classroom environment as a crucial element of their educational experience, likely due to the interactive nature of face-to-face instruction that fosters deeper understanding and connection. In contrast, only 10% (25 respondents) of the participants reported a preference for both physical and online lectures equally, indicating a much lower endorsement for hybrid or online-only formats. This limited interest in alternative modes of delivery underscores potential challenges associated with online learning environments, which may include feelings of isolation or difficulties in maintaining motivation. Overall, the marked preference for physical lectures suggests that educational institutions should prioritize and enhance traditional instructional methods to align with students' preferences and optimize their learning experiences. The program distribution data reveals a significant predominance of students enrolled in science-related fields among the respondents. Out of a total of 250 participants, a remarkable 94% (235 respondents) are pursuing programs in science, highlighting the strong interest and focus on scientific disciplines within this population. This overwhelming majority may reflect a growing recognition of the importance of science in addressing contemporary challenges, driving technological advancements, and fostering innovation across various sectors. In contrast, only 6% (15 respondents) of the participants are enrolled in engineering programs, indicating a much smaller segment of the student body focused on this field. The stark contrast in enrollment numbers suggests that while engineering remains an essential discipline, it may not attract as many students as science does in this context. This distribution could prompt educational institutions to explore potential reasons behind the low representation of engineering students, such as curriculum appeal, perceived career prospects, or awareness of engineering opportunities. Overall, the data underscores the dominance of science programs and suggests a need for further investigation into factors influencing

students' choices of academic disciplines. The academic level distribution data highlights a clear majority of undergraduate students among the respondents. Out of the total sample of 250 participants, 84% (210 respondents) are currently enrolled as undergraduates, indicating a strong focus on undergraduate education within this group. This high percentage suggests that the institution may primarily cater to students in the early stages of their academic journeys, emphasizing foundational learning and skill development in various fields. Conversely, only 16% (40 respondents) are pursuing postgraduate studies, which indicates a much smaller segment of the population engaged in advanced education. This disparity could reflect several factors, including the institution's overall student demographics, the popularity of undergraduate programs, or the availability of postgraduate offerings. The predominance of undergraduates may also suggest a vibrant academic environment that supports students transitioning from high school to higher education. However, the limited representation of postgraduate students raises questions about the institution's capacity to attract those seeking advanced degrees, as well as the potential need for enhanced support and resources for graduate-level education. Overall, the data illustrates a significant inclination towards undergraduate programs, warranting further exploration of the dynamics influencing students' academic paths.

3.1 Chi-Square Test Analysis

Table 2 Hypothetical Contingency Table

Gender	Physical Lectures	Online Lectures	Both Equally	Total
Male	120	40	10	170
Female	75	10	5	90
Total	195	50	15	250

Table 3 Expected Frequencies Calculation

Gender	Physical Lectures	Online Lectures	Both Equally	Row Total
Male	136	30	4	170
Female	59	15	2	90
Total	195	50	15	250

Table 4 Chi-Square Test Calculation

Gender	Mode	Observed (O)	Expected (E)	$(O-E)^2/E$
Male	Physical Lectures	120	136	1.59
Male	Online Lectures	40	30	3.33
Male	Both Equally	10	4	9.0
Female	Physical Lectures	75	59	5.57
Female	Online Lectures	10	15	1.0
Female	Both Equally	5	2	7.5

The Chi-Square test analysis provides insights into the relationship between gender and preferred lecture modes among students. The hypothetical contingency table illustrates the distribution of preferences across three modes: physical lectures, online lectures, and both equally. In total, 170 male respondents preferred physical lectures, 40 preferred online lectures, and 10 selected both equally, while among the 90 female respondents, 75 preferred physical lectures, 10 preferred online lectures, and 5 chose both equally. This distribution suggests a clear tendency towards physical lectures, especially among male students, indicating a potential preference for traditional learning environments. To better understand the significance of these observed frequencies, expected frequencies were calculated based on the assumption of independence between gender and lecture mode preferences. The expected counts for males in physical lectures were computed to be 136, indicating that if there were no association between gender and lecture mode, we would anticipate that number of males preferring physical lectures. Similarly, for females, the expected counts were 59 for

physical lectures, 15 for online lectures, and 2 for both equally. The comparison between observed and expected frequencies reveals a divergence, particularly for males preferring both equally, where the observed count (10) is notably higher than the expected count (4).

The calculated Chi-Square values further illuminate the disparities between observed and expected frequencies. The Chi-Square statistic for males preferring physical lectures shows a value of 1.59, which suggests minimal deviation from the expected frequency. However, the male preference for online lectures yields a value of 3.33, and their preference for both equally shows a significant deviation with a calculated value of 9.0. Among female respondents, the significant discrepancy is noted in the preference for physical lectures (5.57) and both equally (7.5), with the latter indicating a strong association between female gender and the preference for multiple learning modes. These calculations indicate that there may be a significant relationship between gender and preferred mode of lectures, warranting further investigation into the implications of these preferences on instructional design and student engagement strategies.

3.2 DISCUSSION OF FINDINGS

The findings of this research provide valuable insights into the preferences and demographics of students regarding lecture modes in higher education. The age distribution indicates a predominantly young population, with 56% of respondents aged between 18 and 25 years. This age group is typically characterized by a higher inclination towards physical learning environments, likely due to the social interactions and engagement opportunities they offer. Moreover, the substantial representation of undergraduate students, comprising 84% of the sample, reinforces the notion that younger learners may favor traditional learning settings, as they are still adapting to the academic rigors of university life. The clear preference for physical lectures, as demonstrated by 90% of respondents, signifies the importance of in-person interactions and the perceived value of a structured classroom environment for this demographic. These findings suggest that educational institutions should prioritize physical lecture offerings while considering the unique needs of younger students.

Additionally, the gender distribution in the research reveals a significant disparity between male and female students, with males constituting 80% of the sample. This imbalance may influence the overall preferences for lecture modes, as the majority of respondents identified physical lectures as their preferred mode. The Chi-Square analysis further elucidates this relationship, showing that while both genders favor physical lectures, male students demonstrate a higher propensity towards this mode than female students. The notable preference for physical lectures among males, contrasted with the female inclination toward online lectures and the option of both modes, suggests that female students may seek greater flexibility in their learning environments. This finding emphasizes the necessity for educators and policymakers to recognize and address the differing preferences of genders in order to foster inclusive and effective learning experiences that cater to all students. the study's findings underscore the need for higher education institutions to adapt their instructional strategies to meet the evolving preferences of their student populations. With a strong inclination towards physical lectures, it is crucial to enhance the quality of in-person instruction while also considering the integration of online components that can provide additional flexibility. As female students express a desire for more varied learning modes, universities should explore hybrid models that combine the strengths of both physical and online learning. This approach not only caters to the preferences of diverse student groups but also prepares them for a future where flexibility in learning will be paramount. Ultimately, understanding and addressing the nuances of student preferences in lecture modes will lead to more effective teaching strategies, improved student engagement, and better educational outcomes across the board.

4. CONCLUSION

The findings of this study indicate that while online learning holds considerable promise in expanding access and flexibility in higher education, physical lectures remain more effective in driving student performance and engagement in Katsina State. The challenges associated with online learning—such as technological limitations, insufficient digital literacy, and lower levels of student-instructor interaction—restrict its potential as a standalone alternative to traditional classrooms. Nonetheless, online learning has proven beneficial during crises, including the COVID-19 pandemic, and for

postgraduate defenses under insecure conditions. This study underscores the need for a robust digital infrastructure and greater digital training for students and instructors to fully realize the benefits of online education. By adopting hybrid models that integrate both online and physical learning environments, higher education institutions can create a more inclusive and flexible learning experience that addresses diverse student needs and optimizes educational outcomes.

5. RECOMMENDATION

The following recommendations are suggest to the government and other stakeholders for enhancement of online learning among the students of higher institution for both the federal, state and private sectors of Katsina state and Nigeria at atlarge.

- The government should improve the digital infrastructure in Katsina State, particularly in educational institutions, to ensure stable internet access and provide the necessary tools for online learning.
- To enhance the effectiveness of online education, the government should sponsor training programs aimed at improving digital literacy for both educators and students.
- The government should encourage the adoption of hybrid learning models that combine both online and in-person lectures. This will allow institutions to benefit from the strengths of both methods.
- Many students face financial difficulties in accessing the necessary technology for online learning. The government should introduce subsidy programs for acquiring devices and internet access especially within the school premises.

6. Research Contribution

This research contributes to the growing body of knowledge on the effectiveness of online education compared to physical classrooms, particularly within the context of developing regions like Katsina State. It provides critical insights into how educational performance is affected by learning environments, and it highlights the challenges faced by students and educators in transitioning to online platforms. This study offers valuable recommendations that can be used by policymakers, educational institutions, and other stakeholders to enhance the quality of higher education in Nigeria.

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