



## ASSESSMENT OF ICT-BASED INSTRUCTION ON STUDENTS' INTEREST IN EDUCATIONAL STATISTICS IN A NIGERIAN UNIVERSITY

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### Abstract

The integration of Information and Communication Technology (ICT) into higher education has transformed traditional pedagogy, offering innovative strategies to enhance student engagement and learning outcomes. Despite its importance, Educational Statistics remains a course that many Nigerian university students perceive as abstract and challenging, resulting in low levels of interest and engagement. This study assessed the effect of ICT-based instruction on students' interest in Educational Statistics. Using a pre-test-post-test control group, 225 third-year education students (121 male, 104 female) were assigned to experimental and control groups. The experimental group received ICT-based instruction using multimedia presentations, statistical software (SPSS, Excel), online learning platforms, and interactive simulations, while the control group received traditional lecture-based instruction. Data were collected via pre-test and post-test interest inventories, classroom observation checklists, and semi-structured instructor interviews. Quantitative data were analyzed using descriptive statistics, independent samples t-test, and ANOVA, while qualitative data from the interviews were thematically analyzed. Results indicated that students in the ICT-based instruction group demonstrated significantly higher interest in Educational Statistics ( $M = 78.16$ ,  $SD = 6.21$ ) compared to the control group ( $M = 65.44$ ,  $SD = 6.89$ ),  $t(223) = 10.48$ ,  $p < .05$ . ANOVA results confirmed a significant main effect of instructional method on interest, irrespective of gender. Qualitative findings highlighted enhanced students' participation, improved conceptual understanding, and implementation challenges, such as limited ICT

infrastructure and varying digital literacy among the students. The study concludes that ICT-based instruction substantially increases students' interest in Educational Statistics and recommends integrating interactive, technology-driven approaches in quantitative courses to foster motivation, participation, and academic achievement in Nigerian universities.

**Keywords:** ICT-based instruction, Educational Statistics, student interest, higher education, instructional innovation, student participation.

## Introduction

In the 21st century, Information and Communication Technology (ICT) has become a major driver of educational innovation, enhancing teaching and learning across disciplines. Its integration into higher education has been linked to improved engagement, deeper understanding, and better academic performance (Idika, Idaka, & Ukpokor, 2012; Idika, Akubuiro, & Umobong, 2012). ICT-based instruction provides opportunities for interactivity, collaboration, and immediate feedback, key elements in sustaining learners' interest and motivation. In the university context, where the goal is to prepare globally competitive graduates, ICT-enhanced instruction offers powerful tools for developing critical thinking, problem-solving skills, and positive attitudes toward challenging subjects such as Educational Statistics.

Educational Statistics is a core course for education students in Nigerian universities, providing foundational knowledge in research methods, data analysis, and evidence-based decision-making. However, the course is often perceived as abstract and difficult, resulting in low levels of student interest and engagement. ICT-based instruction, through digital simulations, multimedia tools, statistical software, and online learning platforms, has been shown to make learning more interactive and relatable, helping students visualize and apply statistical concepts in meaningful ways (Davies, 2018; Feng & Xie, 2019).

Globally, technologically advanced countries have demonstrated how consistent ICT integration can revolutionize learning outcomes, particularly in science, technology, engineering, and mathematics (STEM) education (Idika, Ovat, Achigbe, & Udumo, 2015). For example, Finland, South Korea, and Singapore have improved academic quality through smart classrooms, digital curricula, and teacher training in ICT competencies. These examples underscore the potential of ICT-based learning to transform education in developing contexts such as Nigeria, where instructional technology adoption remains limited.

Despite widespread recognition of ICT's pedagogical benefits, studies have shown that its effective implementation in Nigerian universities remains suboptimal due to barriers such as inadequate infrastructure, insufficient training, and resistance to change (Byron & Bingham, 2001; Idika, 2016; Idika, Orji, Bichene & Oke, 2022). Yet, empirical evidence continues to suggest that ICT-supported learning enhances students' motivation and interest across disciplines (Duong et al., 2022; Asuquo, 2023; Umunna, 2023). Within

this context, examining how ICT-based instruction influences students' interest in Educational Statistics becomes critical to improving instructional effectiveness and promoting positive learning attitudes.

This study, therefore, assesses the effect of ICT-based instruction on students' interest in Educational Statistics in a Nigerian university. It compares students taught through ICT-based methods with those taught using conventional approaches, and explores their perceptions of how ICT-based instructional strategies sustain learning interest.

### **Statement of the Problem**

Educational Statistics is an essential component of teacher education programs in Nigerian universities, equipping future educators with the analytical skills necessary for data-driven decision-making. However, many students continue to perceive the course as abstract, complex, and intimidating, leading to low engagement or participation, anxiety, and poor academic outcomes (Smith, 2019). Conventional teaching methods, largely lecture-based and instructor-centered, often fail to stimulate student curiosity or connect statistical concepts to real-world educational problems.

The integration of ICT-based instructional strategies presents an opportunity to address these challenges. Through interactive software, simulations, and blended learning environments, ICT can simplify statistical concepts, promote active learning, and enhance student interest. Nonetheless, there remains a gap between policy advocacy for ICT integration and its actual classroom implementation in Nigerian higher education. Factors such as limited technological infrastructure, inadequate staff training, and inconsistent institutional support hinder the widespread use of ICT for teaching Educational Statistics (Idika, 2016; Idika et al, 2022).

Consequently, there is a pressing need to empirically assess how ICT-based instruction affects students' interest in Educational Statistics within the Nigerian university context. Understanding these effects will not only inform pedagogical innovation but also contribute to strategies for enhancing student engagement and learning outcomes in quantitative education courses.

This study is grounded in two complementary perspectives, Constructivist Learning Theory and Self-Determination Theory (SDT), which together provide the conceptual foundation for understanding how ICT-based instruction can influence students' interest in Educational Statistics.

Constructivist Learning Theory, advanced by Piaget (1972) and Vygotsky (1978), views learning as an active and participatory process through which learners construct meaning by interacting with their environment. Rather than receiving knowledge passively, students build understanding by engaging in authentic learning tasks, manipulating information, and connecting new ideas to prior experiences. ICT-based instruction exemplifies these principles by creating dynamic, learner-centred environments that allow students to explore statistical concepts, visualize data, and receive immediate feedback through simulations, animations, and virtual laboratories.

In Educational Statistics, such experiences encourage learners to analyse datasets, test hypotheses, and reflect on outcomes, activities that embody the constructivist ideals of discovery learning, scaffolding, and collaboration. Within the Nigerian university context, where traditional lecture methods continue to dominate, the adoption of ICT tools transforms instruction from teacher-centred delivery to student-centred engagement. This pedagogical shift enhances students' cognitive involvement and fosters a sense of intrinsic interest in statistical learning. Constructivist Learning Theory, therefore, underpins this study by explaining how ICT tools facilitate cognitive engagement and promote active learning, factors essential for sustaining interest in abstract academic subjects such as Educational Statistics.

In complement to this cognitive perspective, Self-Determination Theory (Deci & Ryan, 1985, 2000) provides a motivational framework that explains why ICT-based instruction enhances students' learning interest. The theory posits that intrinsic motivation flourishes when learners' basic psychological needs for autonomy, competence, and relatedness are fulfilled. ICT-based learning environments tend to satisfy these needs by allowing students to exercise control over their learning pace and choices, thereby fostering autonomy; by providing instant feedback through interactive tools and digital assessment, which reinforces competence; and by facilitating collaboration through online discussions and peer learning, which nurtures relatedness.

Within the context of Educational Statistics, the integration of ICT tools helps to demystify complex content, build learners' confidence, and transform apprehension into enthusiasm. Through such experiences, ICT-based instruction promotes sustained internal motivation and deeper interest in learning. Self-Determination Theory is, therefore, relevant to this study because it illuminates the psychological mechanisms through which ICT-based teaching enhances motivation, persistence, and emotional engagement, complementing the constructivist focus on cognitive processes.

By integrating Constructivist Learning Theory and Self-Determination Theory, this study adopts a holistic framework that links the cognitive and motivational dimensions of learning. Constructivism explains how ICT facilitates active knowledge construction and conceptual understanding, while SDT accounts for how such engagement fulfils psychological needs that sustain students' interest. Together, these perspectives provide a robust theoretical foundation for the expectation that students exposed to ICT-based instruction will demonstrate higher levels of interest, engagement, and participation in Educational Statistics than those taught through conventional lecture methods.

### **Research Question**

What are students' perceptions of the effectiveness of ICT-based instructional strategies in enhancing their interest in Educational Statistics from the instructors' point of view?

### **Null Hypotheses:**

1. There is no significant difference in students' mean interest in Educational Statistics when taught using ICT-based instruction and those taught using conventional methods.

2. Gender does not significantly influence students' interest in Educational Statistics when taught using ICT-based instruction.

### **Methodology**

**Research Design:** The study adopted a quasi-experimental pre-test–post-test control group design to examine the effect of ICT-based instruction on students' interest in Educational Statistics. This design was considered appropriate because it enabled the researcher to determine causal relationships between instructional methods and students' interest while maintaining the natural classroom structure. Two groups were used: an experimental group exposed to ICT-based instructional methods and a control group taught using conventional lecture-based methods.

**Population, Sample, and Sampling Technique:** The population of the study comprised third-year undergraduate students enrolled in Educational Statistics courses in a Nigerian university. A sample of 225 students (121 male and 104 female) was drawn from intact classes across four faculties of education using purposive sampling, as the classes had been naturally formed for instructional purposes. Participants were randomly assigned to experimental and control groups to minimize selection bias and ensure comparability between groups.

**Research Instruments:** Two primary instruments were employed for data collection: an Interest Inventory and an Observation Checklist. Interest Inventory was designed to measure students' levels of interest in Educational Statistics before and after exposure to ICT-based instruction. The items were rated on a five-point Likert scale ranging from Strongly Disagree to Strongly Agree. The Observation Checklist was used to monitor classroom participation during instructional sessions. It captured observable indicators such as attentiveness, participation in discussions, and frequency of interaction with ICT tools compared to traditional methods. The researcher interviewed the instructor on the perception of the students' interest and challenge in using ICT-based instruction for the Educational Statistics course.

**Validity and Reliability of Instruments:** The instruments were subjected to content and face validation by three experts in Educational Measurement, Evaluation, and Educational Technology. Their feedback was used to refine the items for clarity, relevance, and alignment with the study objectives. A pilot test was subsequently conducted using 30 students who were not part of the main study sample. Data from the trial testing were analyzed to determine internal consistency using Cronbach's alpha, which yielded reliability coefficients of 0.83 for the Interest Inventory and 0.79 for the Observation Checklist. These values were considered acceptable, indicating that the instruments were both valid and reliable for use in the main study.

**Intervention Procedure:** The intervention lasted for six weeks. The experimental group was taught Educational Statistics using ICT-based instructional strategies that included multimedia presentations, statistical software (e.g., SPSS and Microsoft Excel), online learning platforms, and interactive simulations. The control group, on the other hand, received instruction through traditional lecture methods using chalkboard and printed materials. Both groups covered the same course content, taught by instructors of

comparable experience and qualifications. Before the intervention, both groups took a pre-test interest inventory, and after the intervention, a post-test was administered to determine any significant change in interest attributable to the instructional method. At the end of the six weeks, the researcher, out of curiosity, interviewed the instructor on the perception of the students' interest and challenge in using ICT-based instruction for the Educational Statistics course.

**Data Analysis:** Data collected from the study were analyzed using both quantitative and qualitative approaches. Quantitative data from the pre-test and post-test interest inventories were analyzed using descriptive statistics (mean and standard deviation) to summarize levels of student interest and inferential statistics, including the independent samples t-test and Analysis of Variance (ANOVA), to test for significant differences between groups. Qualitative data from the instructors' interview were analyzed thematically, focusing on recurring themes related to perceived instructional effectiveness and implementation challenges. This mixed-method approach provided a comprehensive understanding of how ICT-based instruction influenced students' interest in Educational Statistics and offered evidence-based insights for improving teaching and learning practices in higher education.

## Results

This section presents the findings of the study on the impact of ICT-based instruction on students' interest in Educational Statistics. The data were analyzed using descriptive and inferential statistics to determine the differences in interest levels between students exposed to ICT-based instruction and those taught through traditional methods, as well as thematic analysis.

Table 1 presents the pre-test and post-test mean scores and standard deviations of students' interest in Educational Statistics for both experimental and control groups.

Group	N	Pre-test Mean	Pre-test SD	Post- Test Mean	Post- Test SD	Mean Gain
Experimental	115	58.43	7.32	78.16	6.21	19.73
Control	110	57.91	7.25	65.44	6.89	7.53

As shown in Table 1, both groups exhibited similar levels of interest in the pre-test, indicating that the groups were comparable at baseline. However, after the intervention, the experimental group recorded a higher mean interest score ( $M = 78.16$ ,  $SD = 6.21$ ) compared to the control group ( $M = 65.44$ ,  $SD = 6.89$ ), suggesting a positive impact of ICT-based instruction on students' interest in Educational Statistics.

To determine whether the observed difference in post-test mean interest scores between the two groups was statistically significant, an independent samples t-test was conducted. The result is presented in Table 2.

Table 2: Post-Test Mean Scores of interest scores between Experimental and Control Groups

Group	N	Mean	SD	T	Df	p-value
Experimental	115	78.16	6.21	10.48	223	.000
Control	110	65.44	6.89			

The result in Table 2 shows that the difference between the experimental and control groups was statistically significant,  $t(223) = 10.48$ ,  $p < .05$ . This implies that students exposed to ICT-based instruction developed significantly higher interest in Educational Statistics than those taught using traditional lecture methods.

### Gender Differences in Students' Interest

A two-way Analysis of Variance (ANOVA) was performed to examine whether gender interacted with instructional method in influencing students' interest. The summary of the analysis is presented in Table 3.

Table 3: A two-way Analysis of Variance (ANOVA) on students' interest by instructional method and gender

Source	SS	Df	MS	F-ratio	p-value	Decision
Instructional Method	6423.82	1	6423.82	52.19	.000	Significant
Gender	108.56	1	108.56	0.89	.346	Not Significant
Interaction	75.23	1	75.23	0.61	.437	Not Significant
Error	27359.64	221	123.85			
Total	34017.25	224				

The ANOVA results revealed a significant main effect of instructional method on students' interest,  $F_{(1, 221)} = 52.19$ ,  $p < .05$ , while gender and the interaction between instructional method and gender were not significant. This indicates that ICT-based instruction significantly improved students' interest regardless of gender.

### Research Question

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Table 4: Thematic Presentation of Instructors' Point of View.

S/N	Theme
1.	Enhanced visualization of abstract statistical concepts
2.	Improved conceptual understanding as evidence of students' vocalization of a satisfactory lesson.
3.	Implementation challenges – inadequate ICT infrastructure, intermittent power supply, and limited digital literacy, as reported.

### Discussion of findings

The findings of this study indicate that ICT-based instruction significantly enhanced students' interest in Educational Statistics compared to traditional lecture methods. Both the experimental and control groups exhibited similar interest levels in the pre-test, confirming that the groups were comparable at baseline. Following the intervention, the experimental group recorded a markedly higher mean interest score ( $M = 78.16$ ,  $SD = 6.21$ ) than the control group ( $M = 65.44$ ,  $SD = 6.89$ ), and the difference was statistically significant,  $t(223) = 10.48$ ,  $p < .05$ . This outcome aligns with the study's objectives of assessing students' interest before and after ICT-based instruction and comparing the impact of ICT versus conventional methods.

The ANOVA results further revealed that the instructional method had a significant main effect on students' interest,  $F(1, 221) = 52.19$ ,  $p < .05$ , whereas gender and the interaction between instructional method and gender were not significant. This suggests that the positive effect of ICT-based instruction on interest is consistent across both male and female students. These findings are consistent with previous studies indicating that technology-assisted instruction can increase engagement and motivation in quantitative subjects (Duong et al., 2022; Umunna, 2023; Asuquo, 2023). It was not surprising that ICT tools improved interest, given the theoretical underpinnings of Constructivist Learning Theory and Self-Determination Theory, which posit that active, interactive, and self-directed learning environments enhance cognitive engagement and intrinsic motivation.

Furthermore, the instructors' responses to the interview on how students perceived the use of ICT-based instruction in the lesson delivery in Educational Statistics. Thematic analysis of the instructors' responses revealed that students were more attentive and participated actively when ICT tools such as simulations and statistical software were used in teaching them Educational Statistics than the conventional ways they were used to. They also noted that ICT facilitated visualization of abstract statistical concepts, which increased students' confidence and curiosity. However, challenges such as inadequate ICT infrastructure, intermittent power supply, and limited digital literacy were reported.

Corroboratively, insights from the instructors' experience with the participants in the experimental group reinforced the quantitative findings in this study. For example, the use of simulations, statistical software, and other ICT resources enhanced students' interest which may have been influenced by perceived knowledge gain in the visualization of abstract statistical concepts. This aligns with existing literature emphasizing the role of multimedia and interactive platforms in making complex content more comprehensible and stimulating (Davies, 2018; Feng & Xie, 2019). Instructors also noted challenges, including inadequate ICT infrastructure, intermittent power supply, and varying levels of digital literacy, which are commonly reported barriers in Nigerian higher education contexts (Idika, Akubuiro, & Umobong, 2012; Idika et al, 2022).

The implications of these findings are significant for both theory and practice. From a theoretical perspective, the results support the integration of Constructivist and Self-Determination frameworks in understanding how ICT can facilitate active learning and sustain intrinsic motivation. Practically, the findings suggest that Nigerian universities should prioritize ICT integration in courses that are traditionally perceived as abstract or

challenging, such as Educational Statistics. Doing so can enhance students' interest, engagement, and ultimately, academic performance. Additionally, institutions should address infrastructural and digital literacy challenges to maximize the benefits of ICT-based instructional strategies.

In conclusion, the study confirms that ICT-based instruction positively influences students' interest in Educational Statistics, providing evidence for the efficacy of interactive, learner-centered approaches in higher education. The findings resonate with global best practices in STEM and quantitative education, indicating the potential for ICT to bridge gaps in student motivation and engagement in Nigerian universities.

### **Implications and Recommendations**

The findings of this study have both theoretical and practical implications for higher education in Nigeria. Theoretically, the results reinforce the relevance of Constructivist Learning Theory and Self-Determination Theory in explaining how ICT-based instruction can enhance students' cognitive engagement and intrinsic motivation in challenging courses such as Educational Statistics. Practically, the study highlights that ICT-based instructional methods can significantly improve students' interest, engagement, and confidence, suggesting that digital tools and interactive learning strategies should be central to curriculum delivery in quantitative subjects. Based on these findings, the following recommendations are proposed:

1. **Integration of ICT in Teaching:** Universities should adopt ICT-based instructional strategies, including simulations, statistical software, and multimedia presentations, in courses perceived as abstract or difficult to increase student interest and comprehension.
2. **Capacity Building for Instructors:** Lecturers should receive continuous professional development in ICT integration to effectively design and deliver interactive lessons.
3. **Infrastructure Development:** Institutions must invest in reliable ICT infrastructure, including high-speed internet, uninterrupted power supply, and access to digital devices, to support sustainable ICT-based learning.
4. **Digital Literacy Programs for Students:** Structured training programs should be implemented to enhance students' digital skills, ensuring they can fully leverage ICT tools for learning.
5. **Policy and Curriculum Review:** University authorities should develop policies and frameworks that embed ICT as a core component of teaching and learning, particularly in STEM and quantitative disciplines.

By implementing these recommendations, universities can create more engaging, learner-centered environments that foster sustained interest and academic success in Educational Statistics and other challenging courses.

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