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Impact of Virtual Classroom Learning on Agricultural Education Students in Niger Delta University, Bayelsa State

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Abstract

The research investigates the effect of virtual classroom learning on Agricultural Education students at Niger Delta University, Bayelsa State. It presents three objectives, research questions, and hypotheses. A descriptive survey design was employed for the investigation. The target population comprised Agricultural Education students, including 81 males and 68 females, totaling 149 students across 100 to 400 levels at Niger Delta University, Bayelsa State. Data were gathered using an 18-item questionnaire. The instrument was subjected to face validation by two specialists. A pilot test was conducted using twenty students from Delta State University (DELSU). The reliability of the instrument was determined using the Cronbach's Alpha method to measure internal consistency. The resulting reliability indices were Section B = 0.74, Section C = 0.83, and Section D = 0.79. Data analysis involved the use of mean and standard deviation to respond to the research questions, while hypotheses were tested using an independent sample z-test at a 0.05 significance level. Findings revealed that virtual classroom learning has both advantageous and unfavourable effects on Agricultural Education students, indicating areas that require improvement. It was recommended that lecturers in Agricultural Education should embrace the use of online instructional and communication tools such as WhatsApp or blogs for sharing assignments. This gradual adoption is expected to improve students' awareness of virtual learning platforms and promote greater engagement with online education.

Keywords: Virtual Classroom, Learning, Agricultural Education

Introduction

The rapid advancement of digital technologies has brought about considerable changes in the educational landscape, introducing innovative strategies for both teaching and learning. One of the most significant developments in this regard is the integration of virtual classrooms into academic programmes, including agricultural education. Virtual classrooms are online learning environments that facilitate real-time engagement between educators and students via internet-enabled platforms. These systems offer learners easy access to instructional content and enable participation in a variety of digital activities, such as online demonstrations, interactive modules,

and simulated field trips. Such features allow learners to explore modern agricultural methods and sustainability principles without being limited by physical distance.

In essence, a virtual classroom is a technological framework that supports remote, interactive teaching sessions, often powered by video conferencing and collaborative software. This digital setting allows for the electronic distribution and engagement with academic materials, lectures, assignments, and class discussions, thus fostering flexible and self-directed learning. These platforms leverage communication technologies such as streaming services, cloud-based collaboration tools, and video communication systems to support dynamic instruction and student participation. As a result, conventional instructional responsibilities, including teaching, evaluation, and administrative duties, are being increasingly enhanced or in some cases, replaced by sophisticated Information and Communication Technology (ICT) tools like email, websites, multimedia content, and teleconferencing applications.

Learning remains a cornerstone of human growth, enabling individuals to adapt to the changing demands of society. While informal learning occurs naturally in daily life, formal learning typically begins in the home and extends through educational systems into professional careers. In the 21st century, learning has moved beyond the limitations of traditional classrooms, fueled by innovative teaching practices and the digital connectivity of both students and educators. Within this context, virtual learning environments provide a flexible alternative, allowing students to access education from any location and at times that suit their personal schedules. Educational institutions serve as structured environments where systematic learning and teaching occur. With the advent of technology, schools are increasingly integrating tools such as the internet, smartphones, and digital applications into their teaching methods. One notable innovation is the virtual classroom, which is steadily being recognized worldwide as a contemporary substitute for the traditional “chalk-and-talk” model. This new model embraces the idea of learners as active participants and positions educators as facilitators who guide the process of knowledge acquisition and character development through digital mediums.

In agricultural education, virtual classrooms hold particular relevance due to the increasing importance of digital competence in agriculture and environmental stewardship. This field of study is designed to impart theoretical knowledge and hands-on skills in farming, land management, and resource conservation. It not only prepares students for careers in agriculture but also encourages further academic pursuits. Agricultural education promotes awareness of environmentally responsible practices, fosters critical thinking, and nurtures leadership within agricultural communities. The incorporation of virtual classroom technologies into agricultural education has reshaped conventional pedagogical methods by expanding access to diverse educational tools and experiences. These include access to online databases, virtual simulations of practical tasks, and digital explorations of agricultural environments. Such resources enhance students’ exposure to a broader range of farming techniques and knowledge systems. Moreover, virtual learning platforms enable students to engage with content at their own pace and convenience, making education more accessible to those balancing other responsibilities, such as work or family obligations. This flexibility often leads to improved academic performance and greater student involvement.

Another significant advantage of virtual classrooms is the opportunity for enhanced collaboration. Students and lecturers can collaborate on group assignments, participate in virtual discussions, and conduct laboratory simulations remotely. These interactions help cultivate vital competencies such

as teamwork, problem-solving, and effective communication all of which are essential in the agricultural workforce. Additionally, virtual learning platforms reduce the need for physical infrastructure and transportation, resulting in lower educational costs. Administrative tasks and student-teacher interactions are also streamlined through digital tools, contributing to efficient academic management. However, despite these strengths, virtual learning in agricultural education presents certain limitations. Issues such as poor internet connectivity, low digital literacy among students, and a lack of adequate technical support can hinder effective implementation. At Niger Delta University in Bayelsa State, for example, students enrolled in Agricultural Education programmes encounter specific challenges, including geographical remoteness and limited access to learning facilities. Virtual classrooms may serve as a potential remedy by increasing access to academic materials and offering more flexible learning opportunities. Nevertheless, the true impact of this digital learning model both its benefits and shortcomings remains to be fully understood. Accordingly, this study aims to evaluate the effect of virtual classroom learning on Agricultural Education students at Niger Delta University, Bayelsa State.

Aims and Objectives of the Study

The main purpose of the study is to examine the effects of virtual classroom learning on agricultural education students in Niger Delta University, Bayelsa State. Precisely the study:

1. identify the positive impacts of virtual classrooms learning on agricultural education students' in Niger Delta University, Bayelsa State
2. identify the adverse impacts of virtual classrooms learning on agricultural education students' in Niger Delta University, Bayelsa State
3. ascertain potential improvement as perceived by agricultural education students for enhancement of learning in virtual classrooms in Niger Delta University, Bayelsa State

Research Questions

1. What positive impacts do virtual classrooms learning have on agricultural education students in Niger Delta University, Bayelsa State?
2. What are the adverse impacts of virtual classrooms learning on agricultural education students' in Niger Delta University, Bayelsa State?
3. What are the potentials for improvement as perceived by agricultural education students' for enhancement of learning in virtual classrooms in Niger Delta University, Bayelsa State?

Hypotheses

The hypotheses were tested at 0.05 level of significance

1. The mean ratings of male and female agricultural education students on the positive impacts of virtual classrooms learning will not differ significantly.
2. The mean ratings of male and female agricultural education students' on the adverse impacts of virtual classrooms will not differ significantly
3. There is no significant difference in the mean ratings of male and female agricultural education students on the potential for improvement as perceived by agricultural education students for enhancement of learning in virtual classrooms

Methodology

The study employed a descriptive survey research design to evaluate the effect of virtual classroom learning on students enrolled in Agricultural Education. This design was selected to allow for the collection of data from participants without altering or influencing any variables. The study population comprised 149 Agricultural Education students at Niger Delta University, Bayelsa State. This group included 81 male and 68 female students across academic levels 100 to 400. Due to the relatively small size of the population, the entire group was incorporated into the study, making sampling unnecessary. The instrument for data collection was a researcher-developed questionnaire containing 18 items, systematically organized into four thematic sections (A–D). Section A of the instrument solicited socio-demographic data from participants, while Sections B through D were constructed in alignment with the study's research questions. Respondents were instructed to indicate their degree of agreement with each item using a four-point Likert response scales, comprising: Strongly Agree (SA) 4, Agree (A) 3, Disagree (D) 2, and Strongly Disagree (SD) 1.

To establish the content validity of the research instrument, it was subjected to expert appraisal by two academics specializing in Measurement and Evaluation within the Faculty of Education, Niger Delta University, Bayelsa State. Their evaluative feedback informed a series of modifications aimed at enhancing item clarity, ensuring content relevance, and aligning the instrument with the study's objectives. Following these revisions, a pilot study was conducted with a purposive sample of twenty undergraduate students from Delta State University (DELSU), who were excluded from the main study population. The internal consistency reliability of the instrument was evaluated through the application of Cronbach's Alpha coefficient, producing the following reliability indices: Section B = 0.74, Section C = 0.83, and Section D = 0.79. These coefficients fall within the acceptable threshold for empirical research. The administration of the questionnaire was facilitated by three trained research assistants, who ensured systematic distribution to the targeted respondents. Adequate time was allotted for participants to complete the instrument, and all copies were retrieved on the same day of administration, yielding a 100% response rate.

The collected data were systematically coded and processed using the Statistical Package for the Social Sciences (SPSS), Version 26. Descriptive statistical of mean and standard deviation were employed to address the research questions. Inferential analysis use involved the z-tests to test the null hypotheses at 0.05 level of significance. A criterion mean value of 2.50 was adopted as the interpretive threshold: item mean scores equal to or greater than 2.50 were interpreted as indicative of agreement, whereas scores below 2.50 signified disagreement. Hypothesis testing was conducted using p-value interpretation; null hypotheses were rejected where $p \leq 0.05$, and retained where $p > 0.05$

Results

Research Question 1: What positive impacts do virtual classrooms learning have on agricultural education students in Niger Delta University, Bayelsa State?

Table 1: mean and standard deviation of the positive impacts of virtual classrooms learning on agricultural education students in Niger Delta University

S/N	Items	Male Students		Female Students		Decision
		$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	
1	I engage in virtual group activities with students from diverse backgrounds in agricultural education.	2.91	1.14	3.37	0.82	Agree
2	I communicate and exchange ideas with agricultural professionals and peers globally through virtual classroom learning.	3.18	0.98	3.20	0.93	Agree
3	I have access to a broad range of agricultural education materials and resources through virtual classrooms.	2.81	1.17	3.52	0.75	Agree
4	Virtual classrooms allow me to progress through agricultural education content at my own pace.	2.91	1.22	3.32	0.83	Agree
5	My digital skills, especially in using technology for agricultural applications, have improved through virtual classroom learning.	2.82	1.17	3.27	0.84	Agree
6	My problem-solving abilities in agricultural practices are enhanced through participation in virtual classroom learning.	3.27	1.01	3.61	0.80	Agree
	Grand Mean	3.21	1.01	3.32	0.77	

The data presented in Table 1 illustrates the mean and standard deviation values, which reflect the positive impacts of virtual classroom learning on agricultural education students at Niger Delta University, Bayelsa State. For male participants, the mean scores across all six items ranged from 2.81 to 3.37, exceeding the established cutoff mean of 2.50, with standard deviations spanning from 0.98 to 1.22. Similarly, female participants recorded mean scores between 3.20 and 3.61, also surpassing the 2.50 threshold, with standard deviations ranging from 0.77 to 0.93. The grand mean score for male students was 3.21, while female students recorded a mean of 3.32. These findings indicate minimal disparity between the two groups, suggesting that virtual classroom learning had a similarly positive impact on both male and female agricultural education students at the institution.

Research Question 2: What are the adverse impacts of virtual classrooms learning on agricultural education students in Niger Delta University, Bayelsa State?

Table 2: mean and standard deviation of the adverse impacts of virtual classrooms learning on agricultural education students' in Niger Delta University

S/N	Items	Male Students		Female Students		Decision
		$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	
7	Managing my coursework in agricultural education through virtual classrooms requires a significant amount of time and self-discipline.	3.00	1.00	3.16	0.83	Agree
8	Virtual learning platforms in agricultural education lack the practical, hands-on experiences provided by in-person laboratory sessions and fieldwork.	3.08	1.07	3.45	0.82	Agree
9	I miss the direct, in-person interaction with my agricultural education peers, which hinders collaborative learning and knowledge exchange.	3.36	1.02	3.30	0.83	Agree
10	I often receive an overwhelming volume of emails and announcements related to agricultural education, which makes it difficult to manage my coursework effectively.	3.27	1.10	3.40	0.81	Agree
11	Delays in finalising my virtual timetable for agricultural education courses sometimes impact the timely completion of assignments.	2.90	1.13	3.47	0.75	Agree
12	Overall, virtual learning in agricultural education seems to incur higher costs compared to traditional classroom-based learning.	3.36	0.80	3.26	0.86	Agree
	Grand Mean	3.40	1.20	2.97	0.73	

Table 2 presents the descriptive statistics, including the mean and standard deviation values, which highlight the negative effects of virtual classroom learning on agricultural education students at Niger Delta University, Bayelsa State. For male participants, the mean scores for all six items ranged from 2.90 to 3.40, all exceeding the predefined threshold mean of 2.50, with standard deviations ranging from 0.80 to 1.13. Similarly, for female participants, the mean scores ranged from 2.97 to 3.47, also surpassing the cutoff mean of 2.50, with standard deviations ranging from 0.73 to 0.86. The overall calculated mean for male students was 3.40, while for female students, it was 2.97. These results indicate minimal gender-based variation, suggesting that the negative impacts of virtual classroom learning were similarly experienced by both male and female students in the agricultural education programme.

Research Question 3: What are the potentials for improvement as perceived by agricultural education students' for enhancement of learning in virtual classrooms in Niger Delta University, Bayelsa State?

Table 3: mean and standard deviation of the potentials for improvement as perceived by agricultural education students for enhancement of learning in virtual classrooms in Niger Delta University

S/N	Item Statement	Male Students		Female Students		Decision
		$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	
13	Enhanced computing devices, including desktops, laptops, and tablets, should be provided for student access.	2.90	1.22	3.45	0.90	Agree
14	Internet access should be ensured in all classrooms and computer labs.	3.36	1.02	3.35	0.83	Agree
15	Students should have unrestricted access to internet services.	3.00	1.09	3.33	0.96	Agree
16	A consistent and dependable power supply is necessary.	2.72	0.90	3.48	0.75	Agree
17	Ongoing professional development is needed for teachers to improve their skills in managing virtual classrooms.	2.81	1.16	3.48	0.71	Agree
18	Some courses should be provided to students at no cost.	3.18	0.98	3.25	0.76	Agree
	Grand Mean	3.11	1.14	2.78	0.13	

Table 3 presents the computed mean and standard deviation values pertaining to the perceived domains requiring enhancement in virtual classroom instruction as identified by agricultural education students at Niger Delta University, Bayelsa State. For male respondents, all six questionnaire items yielded mean values between 2.81 and 3.36, each exceeding the established decision threshold of 2.50, with standard deviation values ranging from 0.90 to 1.22. In a similar trend, female respondents reported mean scores spanning from 3.25 to 3.48, also surpassing the cutoff mean, with standard deviations varying from 0.71 to 0.96. The aggregate mean score for male students was 3.11, while that of female students was 2.78. These statistical outcomes indicate an absence of notable gender-based variance, thereby suggesting that both groups uniformly recognized key areas requiring intervention specifically, the need for expanded access to digital devices, improved internet infrastructure across learning spaces, and consistent electricity supply to strengthen the effectiveness of virtual classroom delivery.

Hypothesis 1: The mean ratings of male and female agricultural education students on the positive impacts of virtual classroom learning will not differ significantly.

Table 4: ***Independent z-test analysis of the difference in the mean ratings of male and female agricultural education students on the impacts of virtual classroom learning***

Variables	N	$\bar{X}$	SD	Df	z-value	p-value	Decision
Male Students	81	3.02	1.05	147	-1.39	0.17	NS
Female Students	68	3.38	0.82				

Table 4 displays the outcome of the z-test inferential analysis conducted to evaluate the difference in the mean responses of male and female agricultural education students concerning the perceived benefits of virtual classroom learning. The computed mean score for male participants was 3.02 with a standard deviation of 1.05, while their female counterparts recorded a mean score of 3.38 with a standard deviation of 0.82. The resulting p-value of 0.71 exceeded the predetermined level of significance $\alpha = 0.05$ at 147 degrees of freedom. Given that the p-value is greater than the alpha threshold, the null hypothesis was retained, indicating no statistically significant difference between the groups ($t(47 = 1.39, p > 0.05$. Consequently, the findings suggest that male and female agricultural education students did not differ significantly in their perceptions of the positive impacts of virtual classroom instruction.

Hypothesis 2: The mean ratings of male and female agricultural education students' on the adverse impacts of virtual classroom will not differ significantly

Table 5: Independent z-test analysis of the difference in the mean ratings of male and female agricultural education students on the adverse impacts of virtual classroom learning

Variables	N	$\bar{X}$	SD	Df	z-value	p-value	Decision
Male Students	81	3.18	1.09	147	0.81	0.17	NS
Female Students	68	3.37	0.75				

Table 5 presents the z-test analysis of the mean ratings for male and female students regarding the negative effects of virtual classroom learning. The mean scores were 3.18 for male students and 3.37 for female students, with standard deviations of 1.09 and 0.75, respectively. At the 0.05 significance level, with 147 degrees of freedom, the p-value was found to be 0.71, which is higher than the alpha value of 0.05. Consequently, as the p-value (0.71) is greater than the alpha level ($t(147) = 0.81, p > 0.05$), the null hypothesis is retained. This indicates that there is no significant difference between the male and female agricultural education students' perceptions of the adverse impacts of virtual classroom learning.

Hypothesis 3: There is no significant difference in the mean ratings of male and female agricultural education students on the areas of improvement as perceived by them for enhancement of their learning in virtual classroom.

Table 6: ***Independent z-test analysis of the difference in the mean ratings of male and female agricultural education students on the areas of improvement for enhancement of their learning in virtual classroom***

Variables	N	$\bar{X}$	SD	Df	z-value	p-value	Decision
Male Students	81	3.07	1.01	147	1.44	0.17	Not sig
Female Students	68	3.41	0.74	147			

Table 6 presents the results of the z-test statistical analysis conducted to determine whether a significant difference exists between the mean ratings of male and female agricultural education students concerning perceived strategies for enhancing virtual classroom learning. The analysis revealed that male students reported a mean score of 3.07 (SD = 1.01), whereas female students had a mean score of 3.41 (SD = 0.74). At a 0.05 level of significance with 147 degrees of freedom, the computed p-value was 0.71, which exceeds the critical alpha level. Since the p-value is greater than the threshold ($t(147) = 1.44$, $p > 0.05$), the null hypothesis was retained. This outcome indicates that there is no statistically significant difference in the perceptions of male and female students regarding viable interventions for improving virtual classroom instruction in agricultural education.

Discussion of Findings

Table 1 displays the computed mean and standard deviation values pertaining to the perceived beneficial outcomes of virtual classroom instruction among agricultural education undergraduates at Niger Delta University. The aggregate mean scores for all items exceeded the established benchmark value of 2.50, thereby signifying a generally affirmative perception of the educational efficacy of virtual learning modalities in the agricultural education context. Correspondingly, Table 4 presents the results of an independent sample z-test examining gender-based differences in mean ratings of these positive impacts. Given that the derived p-value surpassed the predetermined alpha level, the null hypothesis was upheld, indicating no statistically significant difference in perceptions between male and female respondents. This empirical outcome corroborates Anekwe's (2017) findings, which emphasized the pedagogical advantage of flexible, self-paced learning in digital environments. Similarly, Zhao et al. (2021) reported superior performance among students exposed to virtual reality-based instruction compared to those in conventional settings, thereby underscoring the instructional value of virtual platforms.

Table 2 presents the mean and standard deviation statistics for respondents' perceptions of the detrimental effects associated with virtual classroom participation among agricultural education students. All item mean scores exceeded the cutoff threshold of 2.50, indicating prevalent agreement on the existence of negative implications linked to virtual learning experiences. Table 5 displays the z-test analysis comparing gender-based mean scores related to these perceived constraints. Since the resulting p-value exceeded the 0.05 level of significance, the null hypothesis was retained, suggesting no meaningful difference between male and female students in their reported experiences of these challenges. These results are consistent with findings by Posey, Burgess, Eason, and Jones (2012), which identified the substantial temporal demands on both learners and instructors, alongside the limitations imposed by the absence of interpersonal

interaction, as major drawbacks of online education. Becker (2001) similarly asserted that online instructional frameworks fall short in replicating the experiential learning afforded by physical laboratories and fieldwork, particularly salient in practice-based disciplines like agriculture.

Table 3 reports the mean and standard deviation values regarding students' evaluations of requisite structural enhancements to optimise the virtual learning environment for agricultural education at Niger Delta University. The itemised mean scores uniformly exceeded the criterion mean of 2.50, indicating strong consensus among respondents on the need for infrastructural upgrades—specifically the provision of more computing devices, improved internet bandwidth, unrestricted network access, and a consistent power supply to foster effective learning in virtual settings. In parallel, Table 6 presents the outcome of an independent z-test conducted to assess gender-based differences in perceived enhancement strategies. The obtained p-value was greater than the critical alpha value, leading to the retention of the null hypothesis and indicating the absence of a statistically significant difference between male and female students. These findings are in alignment with recommendations by Ifeakor and Anekwe (2013), which emphasised the necessity of advancing internet infrastructure and ensuring equitable digital access as prerequisites for maximising the utility of virtual classrooms in tertiary agricultural education.

Conclusion

The study aimed to evaluate the impact of virtual classroom learning on agricultural education students at Niger Delta University, Bayelsa State. The results show that virtual classroom learning has a positive influence on agricultural education students. This conclusion is further supported by the z-test analysis, which indicates no significant difference between male and female students in their perceptions of the positive impacts of virtual classroom learning. However, the study also identifies several negative effects associated with virtual classroom learning. The analysis suggests that these challenges create substantial difficulties for agricultural education students. Additionally, the z-test analysis shows no significant difference in the perceptions of male and female students concerning these adverse impacts.

The study also identifies several critical areas for improvement to enhance the effectiveness of virtual classroom learning. These areas include increasing the availability of computers and laptops, improving internet connectivity, providing free access to internet networks, and ensuring a stable power supply. Once again, the z-test analysis reveals no significant difference in the perceptions of male and female students regarding these suggested improvements.

Recommendations

The study, recommends that:

1. The management of Niger Delta University should enhance the availability of computers, laptops, and other essential devices while improving internet connectivity across the campus to support virtual learning.
2. The university administration should collaborate with internet service providers to ensure affordable or free internet access for students, and implement dedicated academic data plans to support seamless learning.

3. The Facilities and Maintenance Department should ensure a consistent and reliable power supply by investing in alternative energy sources, such as solar power or backup generators, to guarantee continuous learning without disruptions.
4. Course instructors should integrate virtual learning with face-to-face classes to address issues like the lack of practical experiences and limited student interaction. They should also incorporate virtual simulations to mimic real-world agricultural training.
5. The university's ICT Department should organize regular workshops and training sessions aimed at improving digital literacy for both students and faculty members. Additionally, they should provide continuous technical support to promptly address any technological challenges.

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