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INVESTIGATING STUDENTS' VIEWS ON THE OPPORTUNITIES AND CHALLENGES OF DIGITAL TRANSFORMATION IN AGRICULTURAL EDUCATION PROGRAMMES WITHIN HIGHER INSTITUTIONS IN BAYELSA STATE, NIGERIA

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Abstract

This study investigates students' perceptions of the challenges and opportunities associated with digital transformation in agricultural education programmes within higher institutions in Bayelsa State, Nigeria. A descriptive survey research design was employed, and the study population consisted of 301 respondents, including 234 students from Niger Delta University and 56 students from Isaac Jasper Boro College of Education, Sagbama, Bayelsa State. Given the relatively small population, a census approach was adopted. Data were collected using a self-designed instrument titled Exploring Students' Perceptions of Digital Transformation in Agricultural Education in Higher Institutions in Bayelsa State Questionnaire (ESPDTAEHIBSQ). The instrument's face, content, and construct validity were confirmed by three experts—one Agricultural Educator and two test evaluators from Niger Delta University. Reliability testing using the Cronbach alpha method yielded a coefficient of 0.91, indicating high internal consistency. The study was guided by two research questions and two corresponding null hypotheses. Out of the 301 questionnaires distributed, 266 were properly completed and returned, representing an 88% response rate. Data analysis was conducted using mean and standard deviation for the research questions, while the independent t-test was applied to test the null hypotheses at a 0.05 significance level. A benchmark mean score of 2.50 served as the decision rule, where scores of 2.50 and above were categorized as "Agree," while those below were classified as "Disagree." Analysis was carried out with the Statistical Package for the Social Sciences (SPSS). Findings revealed that both male and female students held similar views regarding the challenges and opportunities of digital transformation, with no significant gender-based differences. Based on these outcomes, the study recommends that government and policymakers provide increased funding and resources to strengthen digital infrastructure and technology accessibility in higher education institutions. Furthermore, it advocates for the integration of digital literacy training into the curriculum to better prepare students with the competencies needed to effectively engage with digital tools in agricultural education.

Keywords: Digital, Digital Transformation, Agricultural Education, Higher Institutions

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Introduction

In recent years, the education sector has undergone significant transformation, largely driven by the rapid advancement of digital technologies. Digital transformation offers immense potential to improve how education is delivered, accessed, and experienced. Through innovative platforms and tools, educators are now better equipped to enhance teaching methods, foster student engagement, and support personalized learning pathways. The COVID-19 pandemic accelerated this process, as prolonged school closures forced institutions to adopt online and remote learning approaches. However, the crisis revealed that simply introducing digital tools does not guarantee improved learning outcomes (Ng'ambi, Brown, Bozalek, Gachago, & Wood, 2016). Instead, it underscored the urgent need for a systemic overhaul of educational systems to align with the realities of digital learning.

Within Nigerian higher education, the Department of Vocational Education plays a central role in delivering agricultural education programs. Agricultural education is essential in preparing students for careers in agriculture by equipping them with the knowledge and skills necessary to address sector-specific challenges. Increasingly, scholars and policymakers emphasize the integration of digital technologies into agricultural education as a way of enhancing farming practices, advancing sustainable development, and improving the overall quality of learning. As Olusoga (2014) notes, agricultural education not only imparts technical knowledge and practical skills for profitable farming but also develops values and intellectual capacity to solve global challenges.

Agbulu (2010) defines agricultural education as structured instruction that provides the knowledge, competencies, and practical training required for employment in vocational agriculture. Similarly, Leising, as cited in Onu, Ugwuoke, and Asogwa (2020), stresses that agricultural education spans both formal and informal systems, covering topics such as horticulture, natural resource management, and the production and distribution of crops and livestock.

Transformation, in general terms, denotes a fundamental change in structure or character. Digital transformation, specifically, is reshaping multiple sectors of society, including education. For education systems to remain relevant, they must evolve to equip learners with both technical skills—such as resource management and digital design—and soft skills such as interpersonal communication, empathy, and social awareness, thereby preparing students for inclusive and equitable societies (World Economic Forum, 2020a). Norton, Shroff, and Edwards (2020) describe digital transformation as a reform of work processes facilitated by innovative digital technologies and new economic models. Mahlow and Hediger (2019) add that true transformation requires a strategic application of technology that considers both organizational and human factors.

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In the context of education, digital transformation has revolutionized conventional teaching practices by embedding technology into curriculum design, assessment methods, and teacher training. This shift fosters a more dynamic and interactive learning environment. Goh and Abdul-Wahab (2020) argue that for this transformation to succeed, educators must be equipped with modern teaching competencies suitable for digitally connected environments, while institutions must also rethink traditional pedagogical approaches.

In agricultural education, the adoption of digital tools is increasingly vital for accessing resources, employing multimedia platforms, and facilitating communication and collaboration between educators and students. The COVID-19 pandemic highlighted this need, as institutions transitioned abruptly to remote teaching to ensure continuity. Yet, this transition also exposed deep inequalities in access to technology. Studies by Thorn and Vincent-Lancrin (2021) and Vincent-Lancrin (2022) emphasize that without reliable connectivity and adequate digital devices, digitalization efforts cannot succeed. Fragoso (2023) further notes that access to appropriate hardware remains a critical barrier for many institutions worldwide.

Importantly, digital transformation extends beyond the provision of hardware and software. Teachers and students must also develop proficiency in the effective use of these tools. While adaptive technologies offer personalized learning, their high cost and limited applicability pose challenges to widespread adoption. Nevertheless, digital transformation allows for tailored learning experiences that consider individual needs, enabling educators to intervene more effectively (OECD, 2021).

Digital technologies also broaden access to educational opportunities. Massive Open Online Courses (MOOCs) and open educational resources provide learners with access to materials often superior to those available locally. Similarly, digitalization enhances cost efficiency, from automating admissions processes to issuing blockchain-verified credentials (Smolenski, 2021). Moreover, it improves convenience by enabling online examinations and asynchronous learning (Kyriazi, 2015; Pokhrel & Chhetri, 2021), while strengthening communication between schools, families, and communities.

In agricultural education specifically, digital competence prepares students for emerging roles in precision farming, data analytics, and agricultural technology development. However, despite these opportunities, higher institutions in Bayelsa State, Nigeria, continue to face challenges in fully integrating digital transformation into agricultural education. Understanding students' perceptions of these opportunities and obstacles is therefore critical. This study seeks to explore how students in higher institutions within Bayelsa State perceive the challenges and opportunities associated with digital transformation in agricultural education programs.

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Purpose of the Study

The major purpose of this study is to investigate the perceptions of students regarding the challenges and opportunities presented by digital transformation in agricultural education programmes in higher institutions in Bayelsa State, Nigeria. Specifically, the study sought to:

1. Identify the challenges perceive by male and female students in the implementation of digital transformation in agricultural education programmes in higher institutions in Bayelsa State.

2. Find out the opportunities perceive by male and female students in the integration of digital technologies into agricultural education programmes in higher institutions in Bayelsa State.

Research Questions

The subsequent research questions were developed to guide the investigation.

1. What are the challenges perceived by male and female students in the implementation of digital transformation in agricultural education programmes in higher institutions in Bayelsa State?

2. What are the opportunities identified by male and female students in the integration of digital technologies into agricultural education programmes in higher institutions in Bayelsa State?

Hypotheses

The two null hypotheses that follow were proposed and will be tested at the 0.05 level of significance:

HO1: There is no significant difference between the mean ratings of the responses of male and female students on the challenges perceived in the implementation of digital transformation in agricultural education programmes in higher institutions in Bayelsa State.

HO2: There is no significant difference between the mean ratings of the responses of male and female students on the opportunities identified in the integration of digital technologies into agricultural education programmes in higher institutions in Bayelsa State.

Methodology

The study used a descriptive survey research approach and targeted Agricultural Education students at Niger Delta University, Wilberforce Island, and Isaac Jasper Boro College of Education, Sagbama, both in Bayelsa State. The overall population comprised of 301 those who responded: 234 from Niger Delta University and 56 from Isaac Jasper Boro College of Education. Given the manageable population size, a census approach was used. Data was collected using a self-designed questionnaire titled "Exploring Students' Perceptions of Digital Transformation in Agricultural Education in Higher Institutions in Bayelsa State" (ESPDTAEHIBSQ), which contained 20 items. The questionnaire used a four-point Likert scale, that range from Strongly Agree (SA = 4) to Strongly Disagree (SD = 1).

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Three specialists from Niger Delta University, one in agricultural education and two in test evaluation, examined the questionnaire's face, content, and construct validity. Their recommendations were included in the final edition of the ESPDTAEHIBSQ. The instrument's reliability was

validated using the Cronbach alpha method, which yielded a reliability value of 0.87, suggesting high reliability. The study was directed by two research topics and their accompanying hypotheses. Of the 301 surveys issued, 266 got returned and evaluated, for a 91% response rate. Three specialists from Niger Delta University, one in agricultural education and two in test evaluation, examined the questionnaire's face, content, and construct validity. Their recommendations were included in the final edition of the ESPDTAEHIBSQ. The instrument's reliability was validated using the Cronbach alpha method, which yielded a reliability value of 0.87, suggesting high reliability. The study was directed by two research topics and their accompanying hypotheses. Of the 301 surveys issued, 266 got returned and evaluated, for a 91% response rate.

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Research Question One

What are the challenges perceived by male and female students in the implementation of digital transformation in agricultural education programmes in higher institutions in Bayelsa State.

Table 1: Mean and standard deviation scores of respondents on the challenges perceived by male and female students in the implementation of digital transformation in agricultural education programmes in higher institutions in Bayelsa State

S/N	Item Statement	Male (n1 = 142)		Female (n2 = 124)		Decision
		$\bar{\chi_1}$	SD1	$\bar{\chi_2}$	SD2	
1	Lack of access to digital devices (computers, tablets, smartphones) for students in agricultural education.	3.47	0.84	3.30	0.92	Agree
2	Shortage of qualified instructors who can effectively integrate digital technologies into agricultural education.	3.35	0.88	3.44	0.81	Agree
3	Lack of reliable internet connectivity in agricultural education facilities.	3.43	0.85	3.49	0.84	Agree
4	Insufficient instruction and assistance for learner's effective use of digital tools. Students receive insufficient guidance and encouragement when utilizing digital tools in agriculture education.	3.39	0.83	3.44	0.78	Agree
5	Limited availability of digital educational resources (e.g., online courses, e-books) for students in agricultural education.	3.35	0.82	3.34	0.90	Agree
6	Resistance among students to adopt digital technologies in agricultural education.	3.44	0.74	3.35	0.81	Agree
7	Lack of financing for the purchase and upkeep of digital infrastructure in agricultural education.	3.44	0.80	3.15	1.00	Agree
8	Lack of policy support from the government or educational institutions for the integration of digital technologies in agricultural education.	3.31	0.84	3.40	0.81	Agree
9	Mismatch between the digital skills required in the agriculture sector and those taught in agricultural education	3.51	0.78	3.28	0.90	Agree
	Ground Mean and Standard Deviation	**3.41**	**0.82**	**3.35**	**0.86**	

The study used a descriptive survey research design, focusing on Agricultural Education students from Niger Delta University, Wilberforce Island, and Isaac Jasper Boro College of Education, Sagbama, both in Bayelsa State. The total sample included 301 participants 234 from Niger Delta University and 56 from Isaac Jasper Boro College of Education. Given the manageable size of the group, a census approach was adopted. Data was collected using a selfdesigned questionnaire titled "Exploring Students' Perceptions of Digital Transformation in Agricultural Education in Higher Institutions in Bayelsa State" (ESPDTAEHIBSQ), which

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consisted of 20 items. The responses were rated on a four-point Likert scale, spanning Strongly Agree (4) to Strongly Disagree (1). Three experts, two from Niger Delta University's test evaluation department and one from the discipline of agricultural education validate the instrument. The finalized version of the survey was improved based on their input. Cronbach's alpha was used to evaluate the questionnaire's reliability; the results showed a reliability value of 0.87, which suggested the instrument was dependable for the research. Two research topics and associated hypotheses served as the study's compass. A 91% response rate was obtained from the 266 returned surveys out of the 301 that were distributed. The mean and standard deviation, with a cut-off value of 2.50, were used to examine the research topics. A score of 2.50 or higher was categorized as "agree," and a score of less than that was categorized as "disagree." The hypotheses were tested at a significance difference of 0.05 using the independent t-test. A p-value of less than 0.05 indicate the rejection of any null hypothesis. The Statistical Package for the Social Sciences (SPSS) was used to analyze the data.

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Research Question Two

What are the opportunities identified by male and female students in the integration of digital technologies into agricultural education programmes in higher institutions in Bayelsa State?

Table 2: Mean and standard deviation scores of respondents on the opportunities identified by male and female students in the integration of digital technologies into agricultural education programmes in higher institutions in Bayelsa State

S/N	Item Statement	Male (n₁ = 142)		Female (n₂ = 124)		Decision
		$\bar{\chi}1$	SD₁	$\bar{\chi}2$	SD₂	
10	Digital technologies can help students accessa wider range of educational resources in agricultural education.	3.38	0.84	3.34	0.89	Agree
11	Digital technologies can facilitate collaboration and communication among students in agricultural education.	3.52	0.76	3.40	0.78	Agree
12	Digital technologies can help students develop practical skills relevant to the agriculture sector.	3.42	0.83	3.40	0.88	Agree
13	Integrating digital technologies into agricultural education can improve the employability of students.	3.33	0.84	3.42	0.74	Agree
14	Digital technologies can help students stay updated with the latest developments in the agriculture sector.	3.46	0.83	3.41	0.86	Agree
15	Integrating digital technologies into agricultural education can help address environmental and sustainability challenges in agriculture.	3.39	0.83	3.57	0.73	Agree
16	Digital technologies can provide students with hands-on learning experiences in agricultural education.	3.34	0.85	3.41	0.81	Agree
17	Integrating technological developments into agricultural education can help learners develop analytical and problem-solving skills.	3.44	0.82	3.48	0.77	Agree
18	Digital technologies can help make agricultural education more accessible to students from diverse backgrounds.	3.50	0.73	3.35	0.82	Agree
		3.42	**0.81**	**3.42**	**0.80**	
	Ground Mean and Standard Deviation					

Table 2 highlights the average responses of male and female students on the opportunities available for integrating digital technologies into agricultural education programs in higher institutions in Bayelsa State. The mean scores for all nine items ranged from 3.33 to 3.57, which are all above the 2.50 cutoff. This shows that respondents generally agreed that these items represent opportunities for digital integration in agricultural education. The overall mean scores for male and female students were 3.42 and 3.42, respectively, both surpassing the cutoff

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of 2.50. This indicates a shared view among respondents that these opportunities are important for enhancing agricultural education programs in Bayelsa State.

Test of Hypotheses

HO1: There is no significant difference between the mean ratings of the responses of male and female students on the challenges perceived in the implementation of digital transformation in agricultural education programmes in higher institutions in Bayelsa State.

Table 3: t-test Analysis of respondents on the challenges perceived by male and female students in the implementation of digital transformation in agricultural education programmes in higher institutions in Bayelsa State

Group	N	Mean	SD	Df	t-value	P-value (Sig)	Alpha level	Decision
Male	142	3.41	0.79	264	0.57	0.59	0.05	NS
Female	124	3.35	0.84					
	266							

Key: SD = standard deviation, NS = Not significant, p> 0.05

Table 3 presents the combined mean responses of male and female students on the challenges they perceived in implementing digital transformation in agricultural education programs in higher institutions in Bayelsa State. According to the table, the mean rating for male students was 3.41, while the mean rating for female students was 3.45. The standard deviations for these two groups were 0.79 and 0.84, accordingly. There is no discernible difference among the ratings of male and female students, according to the t-value of 0.57 at 264 degrees of freedom and the p-value of 0.59. This implies that any discrepancies in their answers are not the result of genuine disagreements but rather of chance variance. The null hypothesis is accepted given the p-value of 0.59 is greater than the significance level of 0.05, indicating that there is no discernible difference between male and female students' perceptions of the difficulties associated with integrating digital transformation into agricultural education programs. These findings demonstrate that both groups have comparable opinions about the challenges that must be over highlighting a shared understanding of the issues involved in improving the integration of digital technologies into agricultural education, regardless of gender.

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HO2: There is no significant difference between the mean ratings of the responses of male and female students on the opportunities identified in the integration of digital technologies into agricultural education programmes in higher institutions in Bayelsa State.

Table 4: t-test Analysis of respondents on the opportunities identified by male and female students in the implementation of digital transformation in agricultural education programmes in higher institutions in Bayelsa State

Group	N	Mean	SD	Df	t-value	P-value (Sig)	Alpha level	Decision
Male	142	3.42	0.79	264	-0.02	0.96	0.05	NS
Female	124	3.40	0.81					
	266							

Key: SD = standard deviation, NS = Not significant, p> 0.05

Table 4 analyzes the average responses of male and female students regarding the opportunities they identified for integrating digital technologies into agricultural education programs in higher institutions in Bayelsa State. The mean ratings were 3.42 for male students and 3.40 for female students, with standard deviations of 0.79 and 0.81, respectively. The table also reveals a t-value of -0.02 and a pvalue of 0.96, demonstrating that male and female students' ratings do not differ significantly. Because the p-value surpasses 0.05, the null hypothesis is accepted. This implies that male and female students in Bayelsa State had similar perceptions of the prospects associated with incorporating digital technologies into agricultural education programs, demonstrating a common grasp of the possible benefits, independent of gender.

Discussion of the Findings

Table 1 summarizes the mean responses of students regarding the challenges they perceived in implementing digital transformation in agricultural education programs in higher institutions in Bayelsa State. Some of the challenges identified include a lack of access to digital devices, a shortage of qualified instructors capable of effectively integrating digital technologies, unreliable internet connectivity, insufficient training and support for students in using digital tools, limited availability of digital educational resources, and student resistance to adopting digital technologies. The mean values for all nine items ranged from 3.15 to 3.51, all exceeding the cutoff point of 2.50. This suggests that respondents acknowledged these items as challenges to implementing digital transformation in agricultural education programs. The grand mean scores of 3.41 for male students and 3.35 for female students also indicate significant agreement on these challenges.

Furthermore, as indicated in Table 3, the p-value of 0.59 exceeds the alpha value of 0.05. Therefore, testing at this alpha level leads to acceptance of the null hypothesis, confirming no significant difference between male and female students in their perceived challenges regarding digital transformation in agricultural education programs. This finding aligns with research by Aljanazrah, Yerousis, Hamed, and Khlaif (2022), which identified primary obstacles to digital transformation during crises, including inadequate technology, unstable internet connections, power outages, and insufficient space for online learning.

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Table 2 shows the average responses from students about the opportunities recognized in integrating digital technologies into agricultural education programs. Mean scores for all nine items ranged from 3.33 to 3.57, all above the cutoff point of 2.50, indicating a consensus that these items represent viable opportunities. The overall mean scores of 3.44 for male students and 3.42 for female students further confirm this agreement. The standard deviation for each item varied between 0.73 and 0.89, with overall standard deviations of 0.81 for male students and 0.80 for female students, suggesting that respondents' opinions were relatively consistent.

Additionally, Table 4 shows a p-value of 0.96, which is greater than the alpha value of 0.05. Testing at this alpha level also leads to acceptance of the null hypothesis, confirming no significant difference in mean ratings between male and female students regarding the opportunities for integrating digital technologies into agricultural education programs in Bayelsa State. These conclusions align with those of Smolenski (2021), who found that digitalization can lead to cost savings in providing verified degrees and credentials through technologies like blockchain. This outcome also supports findings by Kyriazi (2015) and Pokhrel & Chhetri (2021), who noted that using ICT in instruction enhances competency and convenience. Students can complete online exams anytime and anywhere, provided they adhere to the study guidelines and deadlines. Online learning can occur asynchronously, eliminating the need for physical presence.

Conclusion
In conclusion, this study has shed light on the diverse perceptions of students regarding the challenges and opportunities presented by digital transformation in agricultural education programmes in higher institutions in Bayelsa State, Nigeria. The findings highlight the importance of addressing key challenges such as limited access to technology, the digital skills gap, infrastructure challenges, cost barriers, and resistance to change in order to fully leverage the opportunities offered by digital transformation in agricultural education.

Despite these challenges, students recognize the potential of digital technologies to enhance their learning experience, facilitate collaborative learning, create career opportunities, drive innovation in agriculture, and improve the flexibility and accessibility of education. These opportunities underscore the importance of investing in digital literacy training, improving access to technology and infrastructure, and fostering a culture of innovation and openness to change in agricultural education programmes. These insights can inform policy and practice to promote digital transformation in agricultural education programs and contribute to the overall development of the agricultural sector in Bayelsa State, Nigeria.

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Recommendations

To effectively address the findings of the study on students' perceptions of digital transformation in agricultural education programs at higher institutions in Bayelsa State, Nigeria, the following recommendations are proposed for various stakeholders:

1. Government and policy makers should allocate resources and funding to improve digital infrastructure and access to technology in higher institutions.

2. Universities and colleges should incorporate digital literacy training within their curricula to prepare students for using digital tools in agriculture.

3. Educators and researchers should collaborate with industry partners to incorporate relevant digital technologies and practices into agricultural education curricula.

4. Non-Governmental Organizations (NGOs) and Development Partners should Support initiatives that promote digital literacy and access to technology for students in rural and underserved areas.

5. Non-Governmental Organizations (NGOs) and Development Partners should Collaborate with local stakeholders to develop sustainable solutions for addressing challenges and leveraging opportunities in digital transformation in agricultural education.

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