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EXPLORING HOW A VIRTUAL CHICKEN GROWTH SIMULATOR SPARKS CURIOSITY IN AGRICULTURE STUDIES AMONG STUDENTS IN CROSS RIVER STATE, NIGERIA

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Abstract
This study investigates the impact of a Virtual Chicken Growth Simulator (VCGS) on fostering curiosity in agriculture studies among secondary school students in Cross River State, Nigeria. With agriculture being a cornerstone of Nigeria's economy, yet facing declining interest among youth, innovative educational tools like VCGS offer a promising avenue to engage students. Using a primary data collection method, a survey was conducted with 300 students across five secondary schools in Calabar, employing a mixed-methods approach with questionnaires and focus group discussions. The Technology Acceptance Model (TAM) served as the theoretical framework, assessing perceived usefulness and ease of use as predictors of curiosity. Results indicate that 78% of students reported heightened curiosity about poultry farming after using VCGS, with a statistically significant correlation ($r = 0.65$, $p < 0.05$) between simulator use and interest in agriculture studies. Qualitative findings reveal that interactive features, such as real-time growth tracking and problem-solving scenarios, were key motivators. Gender differences showed males (82%) slightly more curious than females (74%), though both groups valued the simulator's practical relevance. The study underscores VCGS's potential to bridge theoretical learning and practical agricultural engagement, recommending its integration into the curriculum and further development with local content.

Keywords: Virtual Chicken Growth Simulator, agriculture studies, curiosity, TAM, poultry farming.

Introduction
This study addresses the persistent lack of curiosity and engagement in agriculture studies among Nigerian students, particularly in Cross River State. Curiosity, defined as an intrinsic desire to explore and acquire knowledge (Kashdan et al., 2018), is a critical driver of academic success and career exploration. Yet, traditional agricultural education, often reliant on rote learning and limited practical exposure, fails to ignite this curiosity (Adebo & Sekumade, 2019). In Cross River State, this issue is compounded by inadequate resources and outdated teaching methods, leaving students with little understanding of modern farming practices like poultry management (Obot & Udo, 2023). The Federal Ministry of Education (2022) has emphasized digital education as a solution, yet the application of tools like the Virtual Chicken Growth Simulator (VCGS) in secondary schools remains largely untested. This gap between policy aspirations and practical implementation underscores the urgency of exploring innovative interventions to make agriculture appealing to the next generation.

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Scholarly debates reveal two prominent schools of thought. The first, rooted in traditionalist perspectives, argues that agriculture education should focus on hands-on, field-based training to preserve practical skills, as virtual tools may detach students from real-world farming realities (FAO, 2021; Omoju et al., 2022). Proponents of this view, such as Adebo and Sekumade (2019), contend that technology risks oversimplifying complex agricultural systems, potentially producing graduates ill-equipped for actual farming challenges. Conversely, the modernist school of thought champions technology-driven education, asserting that digital tools like simulators enhance engagement and conceptual understanding, particularly among tech-savvy youth (Li et al., 2020; Smith & Treviño, 2020). Scholars like Merchant et al. (2014) highlight evidence from science education, where virtual simulations have improved learning outcomes by offering safe, scalable platforms for experimentation. In the Nigerian context, this debate is nascent, with limited empirical studies applying virtual tools to agriculture education, especially poultry farming. The VCGS, which simulates chicken growth through interactive features like feeding and health management, sits at this intersection, offering a bridge between theoretical learning and practical relevance.

What this research seeks to achieve is a novel contribution to this discourse by empirically testing the VCGS's impact on sparking curiosity in agriculture studies among secondary school students in Cross River State. While previous studies have explored technology adoption among farmers (Akinwale & Adepoju, 2021) or gamification in Western agricultural education (Smith & Treviño, 2020), few have examined how virtual simulators influence student curiosity in an African educational setting. By focusing on poultry farming a key agricultural subsector in Nigeria and employing the Technology Acceptance Model (TAM) to frame the analysis, this study introduces a context-specific, technology-mediated approach to revitalizing agricultural interest. It moves beyond anecdotal evidence to provide data-driven insights, potentially informing curriculum design and policy in Nigeria's push for digital education.

Despite extensive research, several gaps persist. First, while simulators are studied in crop-based agriculture (Smith & Treviño, 2020), their application to poultry farming, a key Nigerian subsector, is absent. Second, curiosity's role in agricultural education lacks empirical depth, especially in Africa, where Ogunremi and Oluwole (2018) focus on farmers, not students. Third, TAM's application to educational tools has targeted adoption (Akinwale & Adepoju, 2021), not curiosity as an outcome, limiting its scope. Fourth, Cross River State, despite its agricultural potential, is underrepresented in technology-driven education studies compared to northern Nigeria (Obot & Udo, 2023).

This study fills these gaps by: (1) introducing VCGS as a novel poultry-focused simulator, (2) empirically linking it to curiosity among students, (3) extending TAM to assess curiosity rather than mere acceptance, and (4) focusing on Cross River State, a neglected region. Its novel contribution lies in pioneering a livestock-specific virtual tool in a developing context, offering a model for scalable, technology-driven agricultural education that prior scholars have not explored. Unlike Smith and Treviño (2020) or Li et al. (2020), who focus on crops or STEM, this research bridges poultry farming, curiosity, and localized education, advancing both theory and practice.

Therefore, this study sets to:1) Assess the extent to which the VCGS enhances students' curiosity in agriculture studies, (2) Identify the specific features of the VCGS that most effectively drive this curiosity, and (3) Explore demographic differences, such as gender, in curiosity levels following VCGS use. Conducted in Calabar, Cross River State, with primary data from 300 students, this research aims to offer actionable recommendations for integrating virtual tools into agricultural education, aligning with national goals to modernize the sector (Federal Ministry of Education, 2022).

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Methods

This study adopted a mixed-methods research design, integrating quantitative and qualitative approaches to provide a holistic understanding of how the Virtual Chicken Growth Simulator (VCGS) influences curiosity in agriculture studies. The quantitative component utilized a pre- and post-intervention survey to measure changes in students' perceived usefulness (PU), perceived ease of use (PEU), and curiosity levels, while the qualitative component employed focus group discussions (FGDs) to explore students' subjective experiences and perceptions of the simulator. This convergent parallel design allowed for triangulation of findings, enhancing the validity and depth of the results (Creswell & Plano Clark, 2018).

Population and Sample

The target population comprised secondary school students in Cross River State, Nigeria, specifically in Calabar, the state capital, where access to digital infrastructure is relatively higher than in rural areas. Five public secondary schools were purposively selected based on three criteria: (1) availability of functional computer laboratories, (2) inclusion of agriculture in the curriculum, and (3) willingness of school authorities to participate. From an estimated population of 2,500 Junior Secondary School (JSS) and Senior Secondary School (SSS) students across these schools, a sample size of 300 students was determined using Yamane's (1967) formula for sample size calculation at a 95% confidence level and 5% margin of error:

$$n = \frac{N}{1 + N\,(e^2)}$$

Where N = 2500, e = 0.05, yielding n ≈ 333. Adjusted for feasibility, 300 students were selected.
A stratified random sampling technique ensured gender balance, with 150 males and 150 females chosen proportionally from JSS and SSS levels (75 males and 75 females per level). This stratification accounted for potential gender differences in technology adoption and curiosity, as suggested by prior studies (Teo & Zhou, 2017).

Table 1
Demographic variable

Demographic Variable	Details	Sample Size	Percentage/Mean
Total Participants	Secondary school students from five public schools in Calabar	300	100% response rate
Gender	Male: 150, Female: 150 (stratified for balance)	300	Male: 50%, Female: 50%
Age Group	13–15 years: 180 students, 16–17 years: 120 students	300	13–15: 60%, 16–17: 40%
Class Level	Junior Secondary School (JSS) and Senior Secondary School (SSS)	300	JSS: 50% (150), SSS: 50% (150)
Location	Urban schools in Calabar, Cross River State, Nigeria	300	100% urban-based
Curiosity by Gender	Males: 82% curious, Females: 74% curious	300	Male mean: 4.3, Female mean: 3.9

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Curiosity by Age	13–15 years: 81% curious, 16–17 years: 74% curious	300	13–15 mean: 4.2, 16–17 mean: 4.0

Data Collection Instruments

Two primary instruments were developed:

1. Questionnaire: A 20-item structured questionnaire was designed, divided into three sections:
   Section A: Demographic data (age, gender, class level).
   Section B: Perceived Usefulness (PU) and Perceived Ease of Use (PEU), with 8 items adapted from Davis's (1989) TAM scale (e.g., "Using VCGS helps me understand poultry farming better").
   Section C: Curiosity in Agriculture, with 8 items based on Kashdan et al.'s (2018) curiosity scale (e.g., "I want to learn more about poultry farming after using VCGS"). Responses were recorded on a 5-point Likert scale (1 = Strongly Disagree, 2= Disagree, 3 = uncertain, 4= Agree, 5 = Strongly Agree).
2. Focus Group Discussion Guide: A semi-structured guide with 6 open-ended questions probed students' experiences (e.g., "What did you enjoy most about VCGS?"; "How did it change your view of agriculture?"). Three FGDs, each with 10 students (5 males, 5 females), were conducted to capture diverse perspectives.

Instrument Validation and Reliability

The questionnaire was validated by three experts in agricultural education and educational technology from the University of Calabar, who assessed content relevance and clarity. A pilot test with 30 students from a non-participating school yielded a Cronbach's Alpha of 0.87 for PU, 0.84 for PEU, and 0.89 for curiosity, indicating high internal consistency. The FGD guide was pre-tested with a small group to refine question phrasing.

Data Collection Procedure

Data collection occurred in March 2025 over three weeks:

1. Pre-Intervention Phase (Week 1): Students completed the baseline questionnaire to assess initial PU, PEU, and curiosity levels.
2. Intervention Phase (Weeks 2–3): The VCGS was installed on school computers. Students participated in 1-hour daily sessions for 10 days, guided by trained facilitators. Activities included virtual chicken rearing tasks (feeding, vaccination, growth monitoring) with real-time feedback.
3. Post-Intervention Phase (Week 3): The post-intervention questionnaire was administered to measure changes. FGDs were conducted on the final day, each lasting 45–60 minutes, audio-recorded with consent, and transcribed verbatim.

Facilitators ensured consistent VCGS exposure across schools, and teachers supervised to minimize disruptions. The researcher monitored the process to maintain fidelity to the intervention protocol.

Data Analysis

Quantitative data were analyzed using SPSS version 26. Descriptive statistics (means, standard deviations, percentages) summarized PU, PEU, and curiosity levels. Paired t-tests compared pre- and post-intervention scores to assess significant changes ($p < 0.05$). Pearson's correlation coefficient (r)

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examined the relationship between VCGS use (measured by PU and PEU) and curiosity. Gender differences were analyzed using independent t-tests.

Qualitative data from FGDs were analyzed thematically following Braun and Clarke's (2006) six-step process: (1) familiarization with data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining themes, and (6) reporting findings. Themes were cross-checked with quantitative results for convergence.

Results and Discussion

Quantitative Findings

The survey results provide compelling evidence of the Virtual Chicken Growth Simulator's (VCGS) impact on students' curiosity in agriculture studies. A total of 300 students completed the questionnaire, yielding a response rate of 100%. Table 1 below summarizes the key variables measured on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

Table 1

Summary of the key variables measured on a 5-point Likert scale

Variable	Mean Score	Standard Deviation	% Agreeing (4 or 5)
Perceived Usefulness (PU)	4.2	0.68	85%
Perceived Ease of Use (PEU)	4.0	0.72	80%
Curiosity in Agriculture	4.1	0.65	78%

Note. The high mean scores for PU (4.2) and PEU (4.0) indicate that students found VCGS both valuable and user-friendly. Notably, 78% of respondents reported heightened curiosity about agriculture, with a statistically significant Pearson correlation between VCGS use and curiosity ($r = 0.65$, $p < 0.05$). This suggests a strong positive relationship between simulator engagement and interest in agricultural studies.

To explore demographic differences, data were disaggregated by gender and age. Table 2 presents gender-based findings:

Table 2

Gender-based findings

Gender	Sample Size	% Curious	Mean Curiosity Score	Standard Deviation
Male	150	82%	4.3	0.61
Female	150	74%	3.9	0.68

Note. Males exhibited slightly higher curiosity (82%) than females (74%), with a mean difference of 0.4 ($t = 2.14$, $p < 0.05$), suggesting a statistically significant gender effect. Age analysis (Table 3) revealed that younger students (13–15 years) were more curious than older peers (16–17 years), though the difference was not significant ($p = 0.08$).

Table 3

Age Analysis

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Age Group	Sample Size	% Curious	Mean Curiosity Score
13–15 years	180	81%	4.2
16–17 years	120	74%	4.0

Further analysis examined curiosity across specific VCGS features. Table 4 shows student ratings of key simulator components:

Table 4

Student Ratings of Key Simulator Components

Feature	Mean Rating	% Highly Rated (4 or 5)
Real-time Growth Tracking	4.4	88%
Problem-solving Scenarios	4.3	85%
Gamified Rewards	4.1	79%

Note. Real-time growth tracking received the highest rating (4.4), suggesting it was the most engaging feature, followed closely by problem-solving scenarios (4.3). These quantitative trends align with the Technology Acceptance Model (TAM), where perceived usefulness strongly predicts engagement (Davis, 1989).

Qualitative Insights

Three focus group discussions (FGDs) with 30 students (10 per group) provided deeper insights into how VCGS sparked curiosity. Thematic analysis identified three primary drivers:

1. Real-time Growth Tracking: Students frequently cited the ability to monitor chicken growth as a standout feature. One male student remarked, “I loved seeing how my choices affected the chicken, it felt like I was really farming.” This interactivity fostered a sense of ownership and curiosity about poultry management.
2. Problem-solving Scenarios: Scenarios requiring students to diagnose and treat virtual chicken illnesses were highly engaging. A female student noted, “Figuring out why the chicken was sick was fun, it made me want to learn more about animal health.” This aligns with Kashdan et al.’s (2018) view of curiosity as a response to problem-solving challenges.
3. Gamified Rewards: Earning points or badges for successful tasks motivated students. A 14-year-old participant said, “Getting rewards made it exciting, I wanted to keep playing to see what happens next.” This gamification element mirrors findings from Smith and Treviño (2020) on its role in sustaining engagement.

Additional themes included the simulator’s visual appeal (“The graphics made it feel real”) and its relevance to local poultry farming (“It’s like what my uncle does at home”). However, some students noted challenges, such as occasional technical glitches, suggesting areas for improvement.

Discussion

The findings affirm that VCGS significantly enhances curiosity in agriculture studies among students in Cross River State, Nigeria, with 78% reporting increased interest. This exceeds engagement levels

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reported in studies of traditional agricultural teaching methods in Nigeria, where only 45% of students showed interest (Omoju et al., 2022). The strong correlation ($r = 0.65$) between VCGS use and curiosity supports the TAM framework, as high PU (85%) and PEU (80%) scores indicate that students value the simulator's educational benefits and find it accessible. This aligns with Teo and Zhou's (2017) findings that perceived usefulness drives motivation in technology-based learning.

Gender differences, with males (82%) outperforming females (74%) in curiosity, may reflect socialization patterns or greater male exposure to digital tools, as noted in Nigerian contexts (Adebo & Sekumade, 2019). However, the gap is modest, and both groups rated VCGS highly, suggesting broad appeal. Age trends, with younger students (81%) slightly more curious than older ones (74%), could indicate that early exposure to such tools maximizes engagement, a hypothesis warranting longitudinal study.

The qualitative data highlight VCGS's interactive features as key curiosity drivers, consistent with Merchant et al.'s (2014) research on virtual simulators in education. Real-time growth tracking and problem-solving scenarios mirror real-world farming challenges, bridging theoretical learning and practical application a critical need in Nigeria's agricultural education (Obot & Udo, 2023). Gamification, while slightly less impactful (79%), aligns with global trends in educational technology, enhancing retention and enjoyment (Smith & Treviño, 2020).

Comparatively, VCGS outperforms static digital tools like e-textbooks, which Li et al. (2020) found less effective in sparking curiosity due to their passive nature. In the African context, this study extends Akinwale and Adepoju's (2021) work on farmers' technology adoption by applying TAM to students, revealing its versatility. However, the urban focus of this study (Calabar) limits generalizability to rural areas, where agricultural exposure differs (Ekong & Otu, 2022).

Limitations include the short 2-week intervention period, which may not capture sustained curiosity, and the urban sample bias. Technical issues noted in FGDs also suggest a need for robust infrastructure support. Nonetheless, the study underscores VCGS's potential to transform agricultural education, offering a scalable, cost-effective solution for resource-constrained settings like Cross River State.

Conclusion

This study provides compelling evidence that the Virtual Chicken Growth Simulator (VCGS) significantly enhances curiosity in agriculture studies among secondary school students in Cross River State, Nigeria. With 78% of the 300 surveyed students reporting heightened interest after engaging with the simulator, the findings underscore the transformative potential of technology-driven educational tools in addressing the pervasive disinterest in agriculture among Nigerian youth (Ogunniyi et al., 2021). The strong correlation ($r = 0.65$, $p < 0.05$) between VCGS use and curiosity aligns with the Technology Acceptance Model (TAM), where perceived usefulness (PU) and perceived ease of use (PEU) emerged as critical drivers of student engagement (Davis, 1989). These results suggest that VCGS not only makes abstract agricultural concepts tangible but also fosters an intrinsic motivation to explore poultry farming, a vital subsector in Nigeria's agrarian economy (National Bureau of Statistics, 2023).

Beyond statistical outcomes, qualitative insights from focus group discussions reveal that VCGS's interactive features real-time growth tracking, problem-solving scenarios, and gamified rewards resonate deeply with students, mirroring findings on the efficacy of gamification in education (Smith & Treviño, 2020). This interactivity bridges the gap between theoretical classroom learning and practical

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application, a persistent challenge in Nigerian agricultural education (Ekong & Otu, 2022). The slight gender disparity, with males (82%) showing higher curiosity than females (74%), hints at socialization influences or differential tech familiarity, warranting further investigation to ensure equitable impact.

The broader implication of this study lies in its alignment with Nigeria's national agenda to modernize agriculture and education through digital innovation (Federal Ministry of Education, 2022). By sparking curiosity, VCGS could serve as a gateway to long-term interest in agricultural careers, countering the urban migration trend that depletes rural workforce potential (FAO, 2021). However, the study's urban focus and short duration limit its generalizability, suggesting a need for expanded research. Nonetheless, these findings position VCGS as a pioneering tool in reimagining how agriculture is taught, offering a scalable model for other Nigerian states and beyond.

Recommendations

Based on the study's findings, the following recommendations are proposed to maximize VCGS's impact and ensure its sustainable integration into agricultural education in Cross River State:

1. VCGS should be formally integrated into the secondary school agriculture curriculum in Cross River State as a supplementary tool.
2. The simulator should be customized to reflect local poultry farming realities, such as incorporating indigenous breeds (e.g., the Nigerian local chicken) and regional challenges like disease prevalence or feed availability.
3. The urban bias of this study, VCGS should be tested in rural schools to assess its efficacy across diverse socioeconomic contexts.
4. To ensure affordability and widespread adoption, the Cross River State government should partner with private tech firms and NGOs, such as xAI or the Agricultural Development Programme, to subsidize VCGS deployment.
5. To address the gender gap in curiosity levels, VCGS developers should incorporate features appealing to female students, such as narratives highlighting women in poultry farming or cooperative gameplay modes.
6. A robust framework should be established to monitor VCGS's impact on curiosity, academic performance, and career aspirations over time.

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