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INNOVATIVE APPROACHES TO TEACHING AND LEARNING AGRICULTURAL SCIENCE EDUCATION: ENGAGING STUDENTS IN HANDS-ON LEARNING. A CASE STUDY OF UNIVERSITY OF BENIN

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Abstract

This study examines innovative approaches to teaching and learning agricultural education, with a focus on hands-on learning at the University of Benin. Using a descriptive survey research design, data were collected from 71 randomly selected undergraduate students from a population of 141. A structured questionnaire that validated by 3 experts was administered, the reliability was done with a Cronbach's alpha statistics and this yielded coefficient of 0.73. The instrument was administered by the researchers, while descriptive statistics (mean and standard deviation) were employed for analysis. Findings reveal that digital tools, field-based activities, and practical engagement significantly enhance student interest, cognitive development, and career readiness. However, implementation barriers such as lack of resources, inadequate training, and rigid curricula remain. The study recommends policy reforms, collaborations with industry, infrastructure investment, and educator development programs to support sustainable and effective agricultural education.

Key words: Innovative, engaging, hands-on-learning

INTRODUCTION

In the face of accelerating technological change, climate variability, and evolving labor market needs, agricultural education must be restructured to better equip graduates with relevant, practical, and entrepreneurial skills. This is particularly critical in Nigeria, where agriculture remains a major employer and pillar of national food security (FAO, 2017). Conventional teaching approaches, heavily reliant on lectures and rote memorization, are increasingly seen as inadequate in developing the competencies needed for modern agriculture (Mukembo & Edwards, 2016). This gap necessitates the integration of hands-on learning and innovative teaching methods that promote critical thinking, problem-solving, and practical competence (Ripoll et al., 2017).

Hands-on learning which involves real-world tasks, field-based experiences, and applied problem-solving—has emerged as a viable alternative for improving student engagement and preparing them for professional practice. The shift towards experiential and innovative pedagogies aligns with global educational reforms promoting competency-based learning (Carolan, 2017). The declining interest of youth in agricultural careers is further exacerbated by outdated pedagogical models and limited exposure to real-life agricultural experiences within educational institutions (Mabiso & Benfica, 2019). Engaging students through experiential learning has shown to not only enhance understanding but also influence positive attitudes toward agriculture as a viable and rewarding career (Anyidoho et al., 2021).

Studies have shown that students exposed to practical exercises and digital tools like simulations, mobile applications, and precision farming technologies tend to demonstrate stronger cognitive outcomes and skill acquisition (Leavy & Hossain, 2016; Ige et al., 2016). In the Nigerian context,

programs such as the Youth Employment in Agriculture Programme (YEAP) and Agricultural Youth Empowerment Scheme (AGRIC-YES) advocate for agricultural education that bridges theory with practice (Yeboah et al., 2019).

Despite the clear benefits of hands-on learning, universities face a range of systemic challenges including underfunding, limited access to digital infrastructure, outdated curricula, and a lack of teacher training in modern instructional methods (Sumberg et al., 2021; White, 2020).These constraints challenge the capacity of universities to provide meaningful practical exposure, leaving many graduates ill-prepared for the realities of the agricultural sector. As Mukembo et al. (2017) assert, the quality and relevance of agricultural education are key determinants of youth engagement and productivity in the sector. Consequently, there is a pressing need for both institutional innovation and policy support to drive the integration of experiential learning into agricultural science education.

RESEARCH QUESTION

1. What is the perceived effectiveness of adapting innovative approaches in enhancing the teaching and learning of agricultural science and education?

2. What is the impact of hands-on learning on students' understanding and performance in agricultural science and education?

3. What are the barriers and challenges to adopting innovative approaches in agricultural science and education?

4. What strategies can be implemented to improve innovative approaches to teaching and learning of agricultural science education?

METHODOLOGY

The study adopted a descriptive survey research design, which is suitable for assessing existing conditions without

manipulating variables. This design allows for systematic data collection and analysis to draw meaningful conclusions. The population of the study comprised one hundred and forty-one (141) Agricultural Science Education undergraduate students from the Department of Agricultural Education, Faculty of Vocational and Technical Education, University of Benin, Benin City. Simple random sampling technique was used in sampling 71 students. A structured questionnaire was used as the instrument for data collection. The instrument was validated by three experts from the Faculty of Vocational and Technical Education, The reliability of the instrument was determined using Cronbach Alpha statistics, which yielded a reliability coefficient of 0.73, indicating that the instrument was reliable. The questionnaire was personally distributed to the respondents by the researchers to ensure effective administration and retrieval Data collected was analyzed using mean and standard deviation for the research questions. A mean of 2.50 and above being the criterion level/benchmark was interpreted as agree while mean score below 2.50 were interpreted as disagree.

RESULTS

Research Question 1: What are the perceived effectiveness of adapting innovative approaches in enhancing the teaching and learning of agricultural education?

Table 1: Mean and standard deviation of respondents on adapting innovative approaches to teaching and learning agricultural education.

S/N	Items	SA	A	D	SD	Mean	SD	Decision
1.	Digital tools (such as simulations) used in agricultural education are effective in enhancing my learning experience.	40	50	30	21	3.20	0.86	Accepted
2.	Participating in fieldwork and field trips improves my understanding and relatability to the concepts of agricultural education.	45	60	25	11	3.50	0.72	Accepted
3.	The use of innovative approaches in teaching agricultural education captivates my interest in the curriculum	35	60	30	16	3.30	0.81	Accepted
4.	Technology infusion into agricultural education helps students stay relevant in the 21st-century workplace.	50	45	25	21	3.20	0.88	Accepted

5.	Innovative approaches keep students abreast with the needs of the agricultural industry.	40	55	30	16	3.40	0.75	Accepted
6.	Engagement in practicals in labs and farms enhances cognitive and retention abilities.	55	50	20	16	3.50	0.68	Accepted
7.	Adapting innovative approaches increases student engagement and motivation.	50	55	25	11	3.60	0.72	Accepted
8.	Innovative approaches equip students with necessary tools and skills for a successful career.	45	60	25	11	3.50	0.72	Accepted
9.	There is a need to invest in practical equipment in agricultural education	60	50	20	11	3.70	0.65	Accepted

Data from table 1 shows all the items have mean value range from 3.20-3.70, signifying that all are accepted as adaptive innovative approaches to teaching and learning

agricultural education. The standard deviation of the items ranges from 0.65-0.88, this shows that the respondents are close to one another in their responses.

Table 2: Mean and standard deviation of respondents on the impact of hands-on learning on students' understanding and performance in agricultural education.

Research Question 2: What is the impact of hands-on learning on students' understanding and performance in agricultural education?

S/N	Items	SA	A	D	SD	Mean	SD	Decision
10.	Hands-on learning activities help with easy understanding.	55	60	15	11	3.60	0.70	Accepted
11.	Hands-on learning bridges the gap between theory and practice.	50	60	20	11	3.50	0.72	Accepted
12.	Practical hands-on learning is more engaging than the traditional method of teaching.	45	55	25	16	3.40	0.75	Accepted
13.	Engaging students in hands-on learning gives them an opportunity to experiment well.	50	50	30	11	3.40	0.80	Accepted
14.	Hands-on learning stimulates cognitive development and enhances student learning outcomes.	60	50	20	11	3.70	0.68	Accepted

The data from table 2 shows all the items have mean value range from 3.40-3.70, signifying that all are accepted as the engagement of students in hands-on learning. The standard deviation of the items ranges from o.68-0.80, this shows that the

respondents are close to one another in their responses.

Research Question 3: What are the barriers and challenges to adopting innovative approaches in agricultural education?

Table 3: Mean and standard deviation of respondents regarding the barriers and challenges in adopting innovative approach in agricultural education.

S/N	Items	SA	A	D	SD	Mean	SD	Decision
15.	There is limited access to modern digital tools and technologies in agricultural education.	45	50	25	21	3.20	0.85	Accepted
16.	Teachers lack adequate training on innovative teaching methods.	50	45	25	21	3.20	0.88	Accepted
17.	The curriculum is rigid and does not support flexible or modern teaching methods.	55	50	20	16	3.40	0.75	Accepted
18.	The teaching methods decrease critical thinking and problem-solving skills.	45	55	25	16	3.40	0.75	Accepted

19.	There is insufficient collaboration with agribusiness sectors for applied learning.	50	50	30	11	3.40	0.80	Accepted
20.	Lack of funding and infrastructure limits the implementation of innovative approaches.	60	50	20	11	3.70	0.68	Accepted
21.	Some students have difficulty adapting to digital and technological tools used in teaching.	50	60	20	11	3.50	0.72	Accepted

Data from table 3 shows all the items have mean value range from 3.20-3.70, signifying that all are accepted as the barriers and challenges in agricultural science and education. The standard deviation of the terms ranges from 0.68-0.88, this shows that the respondents are close to one another in their responses.

Research Question 4: What strategies can be implemented to improve innovative approaches to teaching and learning agricultural education?

Table 4: Mean and standard deviation of respondents on Strategies that can be implemented to improve innovative approaches to teaching and learning agricultural education.

S/N	Items	SA	A	D	SD	Mean	SD	Decision
22.	Providing hands-on training through collaborations enriches student skills.	55	50	25	11	3.60	0.72	Accepted
23.	Diversification from traditional to innovative methods is encouraged	50	55	25	11	3.60	0.72	Accepted
24.	Evaluation should monitor the improvement of students.	60	50	20	11	3.70	0.68	Accepted
25.	Collaboration with agribusinesses enhances training with improved technology.	50	60	20	11	3.50	0.72	Accepted
26.	Training workshops should familiarize teachers with modern methods.	55	55	20	11	3.70	0.68	Accepted
27.	Grants for up-to-date equipment should be implemented.	55	50	20	16	3.50	0.80	Accepted

Data from table 4 shows all the items have mean value range from 3.50-3.70, signifying that all are accepted as the strategies that can be implemented to improve innovative approaches to teaching and learning agricultural science and education.. The standard deviation of the items ranges from 0.68-0.80, this shows that the respondents are close to one another in their responses.

DISCUSSION OF FINDINGS

Data gotten from research question one revealed that the perceived effectiveness of adapting innovative approaches in enhancing the teaching and learning of agricultural science are as follows: digital tools such as simulations used in agricultural education are effective in enhancing students' learning experience, participating in fieldwork and field trips improves students' understanding and relatability to the concepts of agricultural education, the use of innovative approaches in teaching agricultural science captivates students' interest in the curriculum, technology infusion into agricultural education helps students stay relevant in the 21st-century workplace, innovative approaches keep students abreast with the needs of the agricultural industry, engagement in practical in labs and farms enhances cognitive and retention abilities,

adapting innovative approaches increases student engagement and motivation, innovative approaches equip students with necessary tools and skills for a successful career, there is a need to invest in practical equipment in agricultural education. These findings are supported by Udu (2018) in the study "Effect of Innovative Teaching Methods on Students' Achievement in Agricultural Science" which emphasized that innovative practices in science education significantly enhance academic achievement. According to Edet and Udo (2020), their study on Digital Agriculture and Workforce Readiness highlights that students trained with emerging technologies such as precision farming, drones, and AI-driven analytics are better prepared for modern agricultural careers. Nwakile et al. (2022) in the study "Effect of Demonstration and Blended Learning Methods on Academic Achievement and Interest of Students in Agricultural Science" found out that these methods positively influenced students' achievement and interest. These findings therefore support that innovative approaches should be adapted to teaching and learning agricultural science and education.

The data findings in research question two revealed that the impact of hands-on learning on students' understanding and performance in agricultural science and education are as follows: hands-on learning activities help with easy understanding, hands-on learning bridges the gap between theory and practice, practical hands-on learning is more engaging than the traditional method of teaching, engaging students in hands-on learning gives them an opportunity to experiment well, hands-on learning stimulates cognitive development and enhances student learning outcomes. In the study by Linda Darling-Hammond, David Osher and Robert Pianta (2019) on The Science of Learning and Development, it was found that active participation in learning activities enhances critical thinking, memory retention, and problem-solving skills. Similarly, it was argued by Adam Kitchel, Sarah McDonald and James Rowe (2021) that hands-on learning stimulates multiple areas of the brain, leading to deeper comprehension and long-term retention of knowledge. Research has consistently shown that hands-on learning is more engaging than traditional lecture-based teaching.

The findings in research question three on the barriers and challenges to adopting innovative approaches in agricultural science education are as follows: there is limited access to modern digital tools and technologies in agricultural science education, teachers lack adequate training on innovative teaching methods, the curriculum is rigid and does not support flexible or modern teaching methods, the teaching methods decrease critical thinking and problem-solving skills, there is insufficient collaboration with agribusiness sectors for applied learning, lack of funding and infrastructure limits the implementation of innovative approaches, some students have difficulty adapting to digital and technological tools used in teaching. These findings align with Amadi and Adejoh (2020) in the study "Challenges in the Integration of ICT in Agricultural Science Education in Rivers State" who identified digital limitations, inadequate teacher training, and

curricular inflexibility. Onyesom et al. (2021) in the study "Barriers to Technology Adoption and Access to Education among Nigerian Farmers" who highlighted the lack of access to technology and training as key barriers that experiential learning seeks to overcome.

The data gotten from research question four on the strategies that can be implemented to improve innovative approaches to teaching and learning agricultural science and education are as follows: providing hands-on training through collaborations enriches student skills, diversification from traditional to innovative methods is encouraged, evaluation should monitor the improvement of students, collaboration with agribusinesses enhances, training with improved technology, training workshops should familiarize teachers with modern methods, grants for up-to-date equipment should be implemented. These findings are supported by Amadi and Adejoh (2020) in the study "Strategies for Enhancing Innovative Teaching of Agricultural Science in Nigeria" who recommended collaboration, diversification, and training workshops to modernize agricultural education. This was also supported by Onyesom et al. (2021) in the study "Leveraging Public-Private Partnerships to Promote Experiential Agricultural Education" who emphasized partnerships and technology-driven learning; and Udu (2018) in the study "Promoting Effective Teaching of Agricultural Science through In-service Training and Curriculum Innovation" who advocated for continuous teacher development and curriculum reform.

CONCLUSION

This study highlights the critical role of innovative teaching approaches, such as hands-on learning and digital tools, in enhancing agricultural science education at the University of Benin. These methods improve student engagement, understanding, and performance, while bridging the gap between theory and practice. However, challenges like limited access to modern technology, insufficient funding, and rigid curricula remain barriers to full implementation. The findings stress the need for adaptable, youth-sensitive policies that address resource limitations, outdated perceptions of agriculture, and the integration of technology. By involving youth in policy formulation and aligning education with industry needs, nations can foster a more resilient and attractive agricultural sector. This approach not only strengthens food security and rural development but also empowers youth, contributing to inclusive growth and reducing rural-urban inequality. However, effective implementation requires overcoming systemic barriers such as underfunding, infrastructure gaps, and limited access to technology. Strengthening institutional capacity and promoting collaboration with the agricultural industry are vital to achieving these reforms.

RECOMMENDATIONS

Based on findings, the following recommendations are proposed to enhance and encourage the incorporation of

innovative approaches to teaching and learning agricultural education at the University of Benin:

•The University should increase the availability of scholarships, grants and other financial aid initiative in order to make agricultural education more accessible

•Implement targeted outreach programs in collaboration with secondary schools, communities, organization and industry partners to raise awareness about the benefits and opportunities in vocational agriculture

• Conduct regular training and workshops for educators on innovative teaching strategies to prepare them and help them understand various career prospects and guide them in making informed decisions about their education

•Engage with local communities, agricultural organizations and industry stakeholders to create partnerships that support agricultural science and education programs and provide students with practical learning opportunities to enable students practice the theory taught in the classroom

•Modern infrastructure and Technology should be introduced at the beginning of the programme to ensure that students can make use of modern tools before graduation and would be able to function properly in the 21st century workplace.

• Expand access to digital and practical tools in agricultural education.

• Revise the curriculum to support experiential and competency-based learning.

• Increase funding and infrastructure development for agricultural programs.

REFERENCES

Ajanaku, O. A. (2024). Effects of hands-on activities on students' attitude and performance in chemistry in Ilorin. International Journal of Educational Research, 45(2), 56–65.

Amadi, O. U., & Adejoh, M. I. (2020). Challenges in the integration of ICT in agricultural science education in Rivers State. Journal of Agricultural Education and Extension, 25(4), 45–53. https://doi.org/10.1080/1389224X.2020.1846750

Anyidoho, N. A., McKeon, P., & Kalibala, P. (2021). Youth aspirations in rural Africa: Engaging the next generation of farmers. Agricultural Systems, 182, 102850. https://doi.org/10.1016/j.agsy.2021.102850

Bennell, P. (2017). Youth employment in sub-Saharan Africa: Policy, challenges, and opportunities. International Journal of Educational Development, 54, 89–98. https://doi.org/10.1016/j.ijedudev.2017.03.003

Carolan, M. (2017). No one eats alone: Food as a social enterprise. Island Press.

Darling-Hammond, L., Osher, D., & Pianta, R. (2019). The science of learning and

development: Enhancing the lives of children and youth. Applied Developmental Science, 24(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

Edet, A. A., & Udo, R. I. (2020). Digital agriculture and workforce readiness: Implications for teaching in higher education. Journal of Contemporary Agricultural Studies, 6(1), 22–34.

FAO. (2017). Youth and agriculture: Key challenges and way forward. Food and Agriculture Organization of the United Nations. https://www.fao.org/youth-and-agriculture

Filgona, J. T., Adeyemi, A. T., & Tunde, F. O. (2016). Effect of hands-on learning strategy on academic performance in geography in Adamawa State. Educational Research and Reviews, 11(12), 120–128. https://doi.org/10.5897/ERR2016.2924

Ige, F. A., Ajayi, I. A., & Oyebanji, M. B. (2016). Influence of practical agriculture on students' academic achievement and career choice. Journal of Agricultural Science, 8(4), 213–221. https://doi.org/10.5539/jas.v8n4p213

IFAD. (2019). Rural youth action plan: Creating opportunities for young rural people. International Fund for Agricultural Development. https://www.ifad.org/en/rural-youth- action Kitchel, A., McDonald, S., & Rowe, J. (2021). Experiential learning and student cognition in agricultural education. Journal of Applied Educational Psychology, 39(3), 312–328.

Leavy, J., & Hossain, N. (2016). Youth entrepreneurship in agriculture: Challenges and opportunities in sub-Saharan Africa. The Journal of Development Studies, 52(10), 1421–1444. https://doi.org/10.1080/00220388.2016.1162764

Maiga, A., Diallo, A., & Traoré, L. (2020). Youth engagement in agricultural value chains: Challenges and opportunities for rural youth in West Africa. Journal of Rural Studies, 75, 92–101. https://doi.org/10.1016/j.jrurstud.2020.02.014

Mabiso, A., & Benfica, R. (2019). Modernizing agriculture through technology and innovation: Enhancing youth engagement in agriculture. Food Policy, 85, 102–113. https://doi.org/10.1016/j.foodpol.2019.02.003

Mukembo, A., & Edwards, D. (2016). Innovative teaching methods in agricultural education: A review of global practices. Education and Training in Agriculture, 58(2), 179–194. https://doi.org/10.1108/ETA-06-2015-0031

Mukembo, A., Wambua, S., & Oduor, O. (2017). Agriculture education in Africa: The role of experiential learning in fostering youth engagement in farming. International Journal of Agricultural Education, 28(1), 22–35.

Nwakile, E. O., Uba, I. I., & Onwudike, P. C. (2022). Effect of demonstration and blended learning methods on academic achievement and interest of students in agricultural science. Journal of Science Education and Technology, 31(3), 202–213. https://doi.org/10.1007/s10956-021-09967-3

Onyesom, M. E., Awah, J. O., & Akpan, E. O. (2021). Barriers to technology adoption and access to education among Nigerian farmers. International Journal of Agricultural Education, 18(2), 88–95. https://doi.org/10.1080/07408842.2021.1939061

Otekunrin, A. O., Akintoye, O. A., & Omoniyi, J. A. (2017). Constraints to effective teaching and learning of agricultural science in secondary schools in Ibadan. Journal of Research in Education, 13(1), 40–49.

Ripoll, C., Rodrigues, F., & Teixeira, F. (2017). Agricultural education for the 21st century: Advancing innovative pedagogical practices. Agricultural Education Quarterly, 48(3), 205–220. https://doi.org/10.1007/s11031-017-9753-9

Sumberg, J., Palmer, J., & Johnson, J. (2021). Agricultural education and rural youth employment: The role of policy in shaping outcomes. Development Policy Review, 39(1), 67–84. https://doi.org/10.1111/dpr.12458

Tambaya, D. (2019). Impact of hands-on learning activities on academic performance of biology students in Zaria. African Journal of Education and Practice, 4(2), 105–113. https://doi.org/10.1007/s11218-019-0951-6

Udu, A. A. (2018). Effect of innovative teaching methods on students' achievement in agricultural science. Journal of Agricultural and Environmental Education, 8(3), 15–22. https://doi.org/10.19030/jaee.v8i3.6194

White, J. (2020). Youth and agriculture: Revitalizing the sector through education and innovation. Agricultural Development Review, 34(2), 113–125. https://doi.org/10.1016/j.agrdev.2020.02.006

Yami, M. A., Shikuku, K. D., & Owino, J. (2019). Promoting effective youth-focused agricultural policies: Leveraging digital technologies and cross-sectoral collaboration. African Policy Journal, 17(1), 122–138. https://doi.org/10.2139/ssrn.3385361

Yeboah, T., Antwi, M., & Adusei, E. (2019). Youth-sensitive policies for sustainable agricultural development in sub-Saharan Africa. Agricultural Policy Review, 56, 120–133. https://doi.org/10.1016/j.apr.2019.05.004