Impact of Edupreneurship on 21st Century Science Education Curriculum Implementation in Adeyemi Federal University of Education, Ondo.

Oyedunni Adebunmi OBE
Adeyemi Federal University of Education Ondo.
obeoa@aceondo.edu.ng

Taiwo John OLADEPO
University of Ibadan, Ibadan.
oladepotaiwo134@gmail.com

Abstract
This study evaluated the impact of edupreneurship on the design of the 21st-century science education curriculum at Adeyemi Federal University of Education, Ondo. This study adopted descriptive research design of Cross-Sectional Survey type. The population for the study consisted all science students in the faculty of science, in Adeyemi Federal University of Education, Ondo. This study adopted 280 students from the Faculty of science, with 40 respondents randomly selected from each of the seven departments within the faculty. Data was gathered through a structured questionnaire titled "Impact of Edupreneurship on 21st Century Science Education Curriculum Design," which was validated by a testing expert and yielded a reliability index of 0.73 through Cronbach's alpha. The collected data were analyzed using frequency counts, simple percentages, and mean scores. The findings indicated that entrepreneurial principles are significantly integrated into the current science curriculum, positively impacting student learning outcomes. It was concluded that while entrepreneurial elements are present in the curriculum, greater emphasis on hands-on projects and entrepreneurial thinking is beneficial. The study recommends that educational institutions and curriculum developers enhance their professional development programs to better incorporate entrepreneurial principles into the science curriculum.

Keywords: Edupreneurship, Science Education Curriculum, Student Learning Outcomes, Implementation Challenges, Entrepreneurial Integration

Introduction

The 21st century has brought about a significant shift in the way we approach education, particularly in the field of science. With the rapid advancements in technology and the growing demand for innovative solutions, traditional teaching methods may no longer be sufficient to prepare students for the challenges of the future. This study explores the impact of edupreneurship, on the design of the 21st century science education curriculum by blending innovative teaching methods with an entrepreneurial mindset i.e edupreneurship. Edupreneurship, a fusion of education and entrepreneurship, represents an innovative approach where entrepreneurial

principles are integrated into educational settings to foster creative thinking, problem-solving, and practical skills among students. Abubakar, et al (2019), emphasized the necessity of embedding entrepreneurial principles into educational practices to foster innovation and practical application of knowledge from the four wall of the classrooms.

This concept involves equipping learners with not only academic knowledge but also the skills needed to identify and exploit business opportunities. According to Martín-Peña et al. (2020), edupreneurship aims to bridge the gap between theoretical knowledge and practical application by encouraging students to develop entrepreneurial projects, thus enhancing their engagement and learning outcomes. The integration of entrepreneurial activities into the curriculum can help students develop critical skills such as risk-taking, innovation, and resilience, which are essential for success in today's rapidly evolving job market (Martín-Peña et al., 2020). Other benefits of incorporating entrepreneurship into education as highlighted by other scholars, which include enhanced critical thinking, creativity, and real-world problem-solving skills (Rodrigues, et al. 2010; and Mullins & Cronan, 2021).

The adoption of edupreneurship in educational institutions also presents several challenges and barriers. Institutions often face difficulties in aligning entrepreneurial activities with traditional curricula, ensuring that educators are adequately trained, and securing necessary resources. There can be resistance to change from both educators and administrators who are accustomed to conventional teaching methods (Rae & Wang, 2018). Despite these challenges, the benefits of incorporating entrepreneurial principles into education are significant, as they prepare students for real-world challenges and foster a culture of innovation and entrepreneurship within educational environments. By addressing these challenges and successfully implementing edupreneurship, educational institutions can better equip students with the skills needed for future success (Rae and Wang, 2018).

Science education is a practical oriented field that equip students with scientific knowledge, skills, and attitudes necessary for understanding and operating in the scientific world. According to Wang, Zhou, and Ye (2021), science education plays a critical role in preparing students for the challenges of the 21st century. Science education comprised biology, physics, chemistry, geology etc. Science education plays a critical role in developing the necessary knowledge and skills that enable entrepreneurs to identify market needs and opportunities, develop innovative products, and come up with sustainable business models. Science education helps entrepreneurs to have a better

understanding of various scientific concepts and apply them in real-world situations. Hameed, Somers, Croft, and Lortie (2021), emphasized the importance of science education in building a scientifically literate society.

The Nigerian science education curriculum has undergone several reforms aimed at improving the quality and relevance of science instruction in schools. The National Policy on Education emphasizes the need for a science curriculum that fosters critical thinking, problem-solving, and practical skills to prepare students for the demands of the modern world (Federal Republic of Nigeria, 2014). Recent curricular updates have introduced a more integrated approach to teaching science, incorporating inquiry-based methods and interdisciplinary learning to enhance students' engagement and understanding (Ogunleye & Babajide, 2018). These changes reflect a broader effort to align Nigerian science education with global standards and to address the challenges of preparing students for a rapidly evolving scientific and technological landscape.

Implementing edupreneurship in Nigeria's educational system faces several significant challenges that impact its effectiveness. One major challenge is the limited infrastructure and resources available for integrating entrepreneurial principles into the curriculum. Many schools in Nigeria lack the necessary facilities and technological tools to support entrepreneurial activities and projects (Akinwale et al., 2020). The scarcity of resources hinders the practical implementation of edupreneurship programs, making it difficult for educators to deliver experiential learning opportunities that are crucial for developing entrepreneurial skills. This limitation affects the overall quality and impact of edupreneurial education, as students may not fully engage in or benefit from the intended learning experiences.

Additionally, there is a lack of comprehensive training and support for educators, which impedes the effective integration of edupreneurship into the science curriculum. Teachers often receive insufficient professional development related to entrepreneurial education, resulting in inadequate preparation to incorporate entrepreneurial activities into their teaching (Akinwale et al., 2020). Furthermore, the resistance to change among educators and administrators who are accustomed to traditional teaching methods poses another barrier (Ogunleye & Babajide, 2018). Overcoming these challenges requires targeted investment in teacher training, curriculum development, and infrastructure improvements to create an environment conducive to edupreneurship and ensure that students gain the skills needed to thrive in a dynamic and competitive world. Ojeifo (2012), emphasized the need for comprehensive support, practical

training, and sufficient resources to integrate entrepreneurship into education successfully. Addressing these barriers is essential for fostering an innovative mindset among students in the 21st century.

Statement of the Problem

The integration of edupreneurship into 21st-century science education curriculum design remains underexplored, despite the government inclusion of entrepreneurship in to both secondary and tertiary level of education; and its potential to revolutionize teaching methodologies and student engagement. Current educational frameworks often lack the entrepreneurial mindset necessary to foster innovation and critical thinking among students. Although there is a growing recognition of the need to embed more entrepreneurial approach in science education by teaching all aspect of science education with entrepreneurial mindset, applying scientific knowledge to solve real life problem, and monetizing scientific knowledge. There is a paucity of empirical research that evaluates the effectiveness of such integration.

Moreover, existing studies predominantly focus on business or general education, neglecting the unique requirements and opportunities within the science disciplines. This gap in knowledge hampers the development of a comprehensive curriculum that can adequately prepare students for the complexities of the modern scientific and technological landscape. Thus, this study aims to investigate the current state of edupreneurship integration in 21st-century science education curriculum design Addressing these gaps is crucial to designing a science education curriculum that not only imparts scientific knowledge but also equips students with the entrepreneurial skills necessary to navigate and succeed in an increasingly complex and dynamic world.

Objectives of the Study

The objectives of this study are to:

1. assess the current state of edupreneurship integration in 21st-century science education curriculum design
2. determine the impact of edupreneurship on student engagement and learning outcomes in science education
3. identify the challenges and barriers to implementing edupreneurship in science education curriculum design

Research Questions

This study aims to explore the integration of entrepreneurial principles in science education through the following three key research questions.

1. What is the current state of integration of entrepreneurial principles in the current 21st-century science education curriculum design?
2. How does the incorporation of edupreneurship in the science curriculum affect student learning outcomes?
3. What are the primary challenges and barriers faced by educators and institutions in implementing edupreneurship within the science education curriculum?

Methodology

This study adopted descriptive research design of Cross-Sectional Survey type. The population for the study were all students in the faculty of science, in Adeyemi Federal University of Education, Ondo. A total of 280 students were involved from the Faculty of science, with 40 respondents randomly selected from each of the seven departments within the faculty. Data were gathered through a structured questionnaire titled "Impact of Edupreneurship on 21st Century Science Education Curriculum Design," which was validated by a testing expert and yielded a reliability index of 0.73 through Cronbach's alpha. The collected data were analyzed using frequency counts, simple percentages, and mean scores.

Results

Research question 1: What is the extent of integration of entrepreneurial principles in the current 21st-century science education curriculum design?

Table 1: Extent of Integration of Entrepreneurial Principle in to Science Curriculum

S/N	ITEM	SA (%)	A (%)	D (%)	SD (%)	$\bar{x}$	REMARKS
1	The curriculum includes projects that require entrepreneurial thinking.	65	70	90	55	2.59	Accept
2	I am encouraged to develop business models based on scientific discoveries	55	75	95	55	2.46	Reject
3	There are limited opportunities for students to collaborate on entrepreneurial ventures.	60	80	85	55	2.55	Accept
4	Entrepreneurship is integrated into science education through hands-on projects.	75	70	85	50	2.72	Accept

5	The curriculum does not support the development of entrepreneurial skills.	50	80	85	65	2.39	Reject
6	Entrepreneurial principles are rarely applied in solving scientific problems.	45	75	95	65	2.36	Reject
7	Students are regularly taught how to commercialize scientific ideas.	70	85	70	55	2.68	Accept
	Grand mean					**2.54**	

Tables 1 shows the analysis on the Extent of Integration of Entrepreneurial Principle in to Science Curriculum. Out of seven items analyzed, four had mean scores above 2.50, indicating some integration of entrepreneurial principles into the 21st-century science curriculum. These areas include projects requiring entrepreneurial thinking (2.59), collaboration on entrepreneurial ventures (2.55), hands-on entrepreneurship projects (2.72), and teaching how to commercialize scientific ideas (2.68). These results show that while entrepreneurial principles are somewhat integrated, especially in practical and commercialization aspects, there is room for improvement in other areas. Three items had mean scores below 2.50, reflecting insufficient integration. These include the encouragement to develop business models from scientific discoveries (2.46), support for developing entrepreneurial skills (2.39), and the application of entrepreneurial principles in solving scientific problems (2.36). These findings suggest that more effort is needed to strengthen entrepreneurship in areas like business model development, skill-building, and applying entrepreneurial principles to scientific problem-solving.

Research question 2: How does the incorporation of edupreneurship in the science curriculum affect student learning outcomes?

Table 2: Impact of Edupreneurship on Students' Learning Outcomes

S/N	ITEM	SA	A	D	SD	$\bar{x}$	REMARKS
1	Integrating entrepreneurship into the science curriculum has improved my academic performance.	70	75	85	50	3.10	Accept
2	Participation in entrepreneurial projects has not contributed to my understanding of scientific concepts.	50	55	85	90	2.10	Reject
3	My problem-solving skills have enhanced due to the incorporation of entrepreneurial principles in science education.	65	80	85	50	2.86	Accept
4	Entrepreneurship activities in the curriculum are unrelated to my learning outcomes in science.	60	50	95	75	2.58	Accept

5	I struggle to apply scientific knowledge to entrepreneurial projects.	45	70	90	75	2.37	Reject
6	Engaging in entrepreneurial science projects has improved my ability to work collaboratively.	80	70	85	45	2.78	Accept
7	The integration of entrepreneurial concepts in science education has had no effect on my critical thinking skills.	55	60	85	80	2.40	Reject
	Grand mean					**2.60**	

Tables 2 shows the analysis on the impact of Edupreneurship on Students' Learning Outcomes. Out of seven items analyzed, four had mean scores of 2.50 or higher, indicating that students agree the integration of entrepreneurship into the science curriculum positively impacts learning outcomes. These benefits include improved academic performance (3.10), enhanced problem-solving skills (2.86), better collaborative abilities through entrepreneurial science projects (2.78), and a general connection between entrepreneurship activities and science learning outcomes (2.58). However, three items had mean scores below 2.50, indicating less enthusiasm or disagreement. Students did not believe entrepreneurial projects significantly aid in understanding scientific concepts (2.10), that applying scientific knowledge to entrepreneurial projects is difficult (2.37), or that entrepreneurship improves critical thinking skills (2.40). These findings suggest that while entrepreneurship integration is seen as beneficial, its impact on certain areas like critical thinking and understanding scientific concepts is less significant.

Research question 3: What are the primary challenges and barriers faced by educators and institutions in implementing edupreneurship within the science education curriculum?

Table 3: Challenges and Barriers of Implementing Edupreneurship in Science Curriculum

S/N	ITEM	SA	A	D	SD	$\bar{x}$	REMARKS
1	Lack of sufficient training for educators on how to integrate edupreneurship into the science curriculum.	70	95	85	30	2.78	Accept
2	There is inadequate funding to support edupreneurship initiatives in science education.	80	105	65	30	2.86	Accept
3	Limited resources and materials are available for implementing edupreneurship in science classes.	60	100	85	35	2.53	Accept
4	Educators are not motivated to adopt edupreneurship approaches	50	85	100	45	2.28	Reject

	due to lack of incentives.						
5	The current curriculum does not support the integration of entrepreneurial principles effectively.	55	105	75	45	2.50	Accept
6	There is resistance from institutions to adopt new edupreneurship- focused methods.	70	95	70	45	2.53	Accept
7	The training provided to educators on edupreneurship is not practical or applicable.	60	75	95	50	2.36	Reject
	Grand mean					**2.55**	

Tables 3 shows the analysis on Challenges and Barriers of Implementing Edupreneurship in Science Curriculum. Out of seven identified barriers to integrating edupreneurship into the curriculum, five had mean scores of 2.50 or higher, indicating agreement that the current curriculum does not support this integration. These barriers include insufficient educator training (2.78), lack of funding (2.86), limited resources (2.53), the curriculum's lack of entrepreneurial principles (2.50), and resistance from institutions (2.53). These reflect challenges related to financial constraints and institutional resistance. However, two items received lower mean scores, suggesting less concern. Item 4, related to educator motivation, scored 2.28, and Item 7, regarding the practicality of educator training, scored 2.36. Both were marked as less critical barriers.

Discussion of findings

The finding from research question 1 indicates that the current 21st-century science education curriculum in Nigeria incorporates entrepreneurial principles to a notable extent, with various elements such as projects requiring entrepreneurial thinking and hands-on projects designed to integrate entrepreneurship into science education being accepted by a significant portion of respondents. However, there are concerns about the adequacy of opportunities for developing business models based on scientific discoveries and the overall support for entrepreneurial skills within the curriculum. These findings resonate with the research by Abubakar, et al (2019), which emphasizes the necessity of embedding entrepreneurial principles into educational practices to foster innovation and practical application of knowledge from the four wall of the classrooms. Integrating entrepreneurship into science education can enhance students' ability to commercialize scientific ideas, thereby preparing them for the demands of the 21st-century job market and promoting a culture of innovation and problem-solving.

The finding from research question 2 indicate that the incorporation of edupreneurship in the science curriculum positively affects student learning outcomes in several key areas. A majority of students report improved academic performance and enhanced problem-solving skills due to the integration of entrepreneurial principles, suggesting that these activities foster a deeper understanding of scientific concepts through practical application. However, there are some reservations, as some students feel that entrepreneurial activities are unrelated to their learning outcomes in science and struggle to apply scientific knowledge to these projects. The accepted items in research question 2 are in line with the research Rodrigues, et al. (2010); and Mullins & Cronan, (2021) which highlights the benefits of incorporating entrepreneurship into education, including enhanced critical thinking, creativity, and real-world problem-solving skills. Overall, the positive impact on academic performance and skill development underscores the importance of integrating entrepreneurial concepts in science education to prepare students for the challenges of the 21st century.

The finding from research question 3 indicate several significant challenges and barriers faced by educators and institutions in implementing edupreneurship within the science education curriculum. A major issue is the lack of sufficient training for educators on integrating entrepreneurial principles, which is crucial for effective implementation. Inadequate funding further hampers these initiatives, as financial support is essential for resources and program development. Limited resources and materials also pose a challenge, making it difficult to implement edupreneurship effectively. Additionally, the current curriculum does not adequately support the integration of entrepreneurial principles, necessitating structural changes for better alignment. Institutional resistance to adopting new edupreneurship-focused methods highlights a broader reluctance to embrace innovative teaching approaches. However, a lack of incentives for educators and the impracticality of current training programs also impede progress. These challenges align with findings from Ojeifo (2012), who emphasized the need for comprehensive support, practical training, and sufficient resources to integrate entrepreneurship into education successfully. Addressing these barriers is essential for fostering an innovative mindset among students in the 21st century.

Conclusion

It was concluded that the current 21st-century science education curriculum incorporates entrepreneurial principles to some extent, with notable acceptance of projects requiring

entrepreneurial thinking and hands-on integration into science education. However, there are concerns about the adequacy of opportunities for developing business models based on scientific discoveries and the overall support for entrepreneurial skills. The curriculum positively impact students learning outcomes, enhancing academic performance, problem-solving skills, and collaborative abilities. Despite these benefits, some students feel disconnected from entrepreneurial activities and struggle to apply scientific knowledge to these projects. Addressing challenges such as inadequate educator training, insufficient funding, limited resources, and institutional resistance is essential for the successful integration of edupreneurship, to prepare students for the 21st-century job market and promote a culture of innovation and problem-solving.

Recommendations

1. **Curriculum Developers and Educators** should integrate more opportunities for business model development and focus on entrepreneurial skill-building to better prepare students for the job market.
2. **Educational Institutions and Policy Makers** should provide comprehensive training and resources for educators to effectively integrate entrepreneurial principles into science education.
3. **Government, Educational Institutions, and Industry Partners** should secure funding, promote institutional support, and foster collaboration between schools and industry to overcome barriers to edupreneurship.

References

Abdullahi, M., & Abdulwahab, A. (2020). Challenges and prospects of science education in Nigeria: A critical review. *Journal of Education and Practice, 11* (1), 44-50.

Abubakar, I.M., Yusri, B.K., NurHusnaBinti, A & WaleedMugahed A. (2019). The need for integrating entrepreneurial education and training in Nigerian Technical Colleges. *International Journal of Recent Technology and Engineering (IJRTE),8* (3),

Akinwale, A. A., Tanimowo, T. S., & Oladipo, S. O. (2020). The challenges of implementing edupreneurship in Nigerian schools: a focus on infrastructure and resources. *Journal of Educational Administration and Policy*, 12(3), 55-67.

Federal Republic of Nigeria. (2014). *National Policy on Education*. NERDC Press.

Hameed, S., Somers, G., Croft, J., & Lortie, M. (2021). The importance of science education in building a scientifically literate society. *International Journal of Science Education*, 43(15), 2565-2581.

Martín-Peña, M. D., de Castro, R. J., & Fernández-Morales, A. (2020). Edupreneurship and Its Impact on Student Learning Outcomes: A Comprehensive Review. *Journal of Educational Research and Practice*, 10(1), 115-130.

Mullins, J. K., & Cronan, T. P. (2021). Enterprise systems knowledge, beliefs, and attitude: A model of informed technology acceptance. *International Journal of Information Management, 59*(1), 102348. https://doi.org/10.1016/j.ijinfomgt.2021.102348

Ogunleye, A., & Babajide, S. (2018). Reforming Science Education in Nigeria: Perspectives and Issues. *International Journal of Science Education*, 40(5), 503-521.

Ojeifo, S.A. (2012), Entrepreneurship Education In Nigeria. Journal of Education and Practice. Vol 3, No 14, pp 78-82.

Rae, D., & Wang, C. (2018). Entrepreneurial learning and education: insights and approaches. *International Journal of Entrepreneurial Behavior & Research*, 24(4), 665-680.

Rodrigues, R. G., Raposo, M., Ferreira, J., & Do Paco, A. (2010). Entrepreneurship education and the propensity for business creation: Testing a structural model. *International Journal of Entrepreneurship and Small Business, 9*(1), 58–73. https://doi.org/10.1504/IJESB.2010.029506

Wang, X., Zhou, M., & Ye, Z. (2021). Science education and its role in preparing students for the challenges of the 21st century. *Journal of Science Education and Technology*, 30(5), 707-721.