Development of Entrepreneurial Skills among Pre-Service University Teachers through Physics Education in Ilorin, Nigeria

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Abstract
The formal type of education system in Nigeria has not adequately given students a functional education rather, it has produced graduates with certificates that could not fit into the industries and labour market due to lack of the required competencies and skills. The rate of unemployment among Nigerian graduates has given rise to integrating entrepreneurial education into Physics education curriculum so that students can become self-reliant and self-employed. Hence, this paper examined the development of entrepreneurial skills in pre-service university teachers through physics education in Ilorin, Kwara State. Three research questions were raised and answered in this study. The study was a descriptive survey design with a sample size of 126 pre-service Physics teachers that were selected from three universities in Ilorin. Purposive sampling technique was used to select universities that offers Physics education as a course. The validated instrument contained 25-item structure questionnaire. The reliability for the index was 0.77 using Cronbach Alpha technique. Mean and Standard Deviation were used to analyse the data collected. The findings of the study showed that pre-service teachers were able to identify entrepreneurial skills in Physics as well as teaching methods that could lead to the development of these skills. However, a low competency of entrepreneurial skills among the students was found. Suggestions and recommendations were therefore made to this effect.

Keywords: Physics, Physics Education, Entrepreneurship Education, Competencies, Entrepreneurial skills.

Introduction

Entrepreneurial skills are the practical and technical abilities that individuals can acquire and develop through specific educational programs, such as Physics education, which enable students to engage in entrepreneurial activities. These skills encompass a range of technical and hands-on proficiencies, including vulcanizing, tailoring, plumbing/pipe fitting, auto mechanics, phone repair, electrical installation, photography, automobile rewiring, and generator repair. The acquisition of these skills equips individuals with the capability to create, manage, and grow business ventures, thereby fostering self-reliance and contributing to economic development.

One of the means of developing entrepreneurial skills in students is through the teaching and learning of science. Science education is concern with engaging individual to take action (scientific activities) on science and technology–related matters (Haruna, 2020). Science and technology are keys to refurbish economic growth and the advancement of a nation's technology as it provides solution to life problems (Badmus & Omosewo, 2018). Science and technology serve as major tools in enhancing economic growth in Nigeria. One of the causes of poor economic growth in Nigeria is unemployment among graduates. This is because our education system takes care of theories but little or no practical skills acquisition that might lead to self-reliant of its beneficiary (Egolum & Chukuma, 2013).

Physics as one of the pure science subjects, deals with the exploration of the universe, the energy transformation and the interaction of matter. It provides the concept behind technology and as a result, there is need to lay emphasis on teaching and learning of Physics. Physics education is therefore aimed at training students to acquire good understanding of the basic principles of science as well as its applications (Shehu et al., 2017). It also aimed at developing in students the appropriate scientific mindset as an essential for future scientific activities. It is the intellectual and practical preparation of people for earning a living (Nwoye, 2012). The contribution of Physics to entrepreneurship in education includes skills such as problem-solving skills, creativity, innovation, technological development (Physics-related technologies), interdisciplinary collaboration (cutting across field of Engineering, Computer Science, Medicine and Material Science among others) as fundamental means of recognizing opportunities which can translate to wealth generation and alleviate poverty rate. This implies that Physics education students (pre-service Physics teachers) should be able to acquire the intellectual and entrepreneurial skills that will help them to create wealth or create their own employment since the teaching of Physics is to produce scientists who are able to design some technological devices that could make daily activities easier and more

comfortable for livelihood (Badmus & Omosewo, 2018) hence, a reduction in the rate of unemployment.

Entrepreneurship education is the process of acquiring knowledge and skills that empowers an individual to take charge of the future (Okafor, 2019). One of the aims and objectives of entrepreneurship education as stated in the National Policy on Education (FRN, 2014) is to prepare individuals for useful living in the society. Eya (2015) opined that entrepreneurship education is a planned method of acquiring entrepreneurial skills for effective living which might lead to development and economic growth. According to Amos and Onifade (2013), entrepreneurship education is seen as transmission of ideas, knowledge and skills to new situations while Agommuoh and Joseph-Kalu (2020) viewed entrepreneurship education, as one that helps an individual to take financial risk using the available human and material resources at one's disposal. Hence, graduates who had gone through entrepreneurship education, should be able to develop more entrepreneurial skills and commercialized opportunities recognized which might help them to secure job or create job after school and become self-reliant.

Entrepreneurial skills are skills needed to develop an enterprise. Nwoye and Okeke (2019) opined that knowledge and skills acquired by Physics students could help in developing entrepreneurial skills for job and wealth creation. Entrepreneurial skills are the use of ideas which help an individual to develop competencies needed to for career commitment for better performance (Matazu & Julius, 2017) while Amadi and Chuku (2021) viewed entrepreneurial skills as business opportunity skills. Competencies are the knowledge, skills and behaviours that will enable one to meet an established standard (Pepple & Enuoh 2020). It is the combination of knowledge, abilities and behavior which may contribute to an individual development and performance in a particular setting. Pleshette (2009) explained the development of entrepreneurial skill is based on identifying the present and future skills needed in a venture. Identification of entrepreneurial skills is concern with the ability of a person to discover idea or opportunities that can lead to self-employment or self–reliant for the purpose of generating income. Furthermore, when entrepreneurship is integrated into education, students would be able to identify and leverage business opportunities, develop essential skills for starting and managing their own enterprises, and ultimately contribute to economic growth and societal development.

The formal type of education system in Nigeria has not adequately given students a functional education but rather emphasizes certification (Agommuoh & Joseph-Kalu, 2020) which

most graduates are deficient in skills and competencies that could fit in to labour market thereby leading to under-employment and/or unemployment**.** To curb the rate of unemployment among Nigerian graduates, it is important to encourage acquisition of entrepreneurial skills. In other to develop entrepreneurial skills in students, some teaching methods/ strategies need to be put in place. Hence, it important for teachers who are the instrumental of implementation discover the method of teaching that could facilitate the inculcation entrepreneurial skills in students. Therefore, this study examined the identification of entrepreneurial skills and competencies that can be acquired through teaching and learning of Physics.

Purpose of the Study

The study specifically sought to

1. Identify the entrepreneurial skills that can be acquired by university pre-service teachers through Physics education.
2. Examine the level of competencies acquired by pre-service Physics teachers for the development of entrepreneurial skills.
3. Investigate the methods that can be used to develop entrepreneurial skills in students through Physics education.

Research Questions

The following research questions were answered in this study:

1. What are the entrepreneurial skills needed by pre-service Physics teachers through Physics education?
2. What is the level of competencies acquired by pre-service Physics teachers for the development of entrepreneurial skills?
3. What are the methods that can be used to develop entrepreneurial skills in students through Physics education?

Methodology

This study was a descriptive research of the survey type. The study was carried out in three universities in Ilorin, Kwara State (Two public and One private university). The target population for this study comprised 850 pre-service science teachers. Purposive sampling technique was used to select 126 pre-service Physics teachers because of their relevance to the study from the three universities that offer Physics Education as a course.

The research instrument was a structured questionnaire developed by the researcher "Development of Entrepreneurial Skills through Physics Education". The questionnaire consisted of two sections. The first part describes the personal data of the respondent while the second part contained 25 items which was segmented into three parts – A, B and C. Part A sought to obtain the entrepreneurial skills that can be acquired in Physics using a 3-point scale and rated as follows: Very Much Acquired (VMA) =3, Acquired (A) = 2 and Not Acquired (NA) =1. Part B was designed to elicit responses on the pre-service teachers' competencies on entrepreneurial skills acquired using 4–point scale weighted as follows: Novice (N) =1, Beginner (B) =2, Competent (C) =3 and Proficient (P) =4. Also, part C was constructed to elicit responses on the teaching methods that could lead to the development of entrepreneurial skills using a 4-point Likert scale rated as follows: Strongly Agree (SA) =4, Agree (A) =3, Disagree (D) = 2 and Strongly Disagree (SD) =1. The research instrument was validated by two lecturers from the Department of Science Education, University of Ilorin. Cronbach Alpha coefficient was used to test for reliability index which yielded 0.77. With the help of two research assistants, 150 questionnaire materials were distributed out of which 126 were returned.

Percentage was used to analyse research questions 1 while mean and standard deviation were used to answer research questions 2 and 3. For Part A, the frequencies within 0-42 (less than 34%) were regarded as Not Acquired, 43-84 (34-67%) as Acquired and 85-100 (above 67 %) were regarded as skills that can be much acquired. The Part B which is about competency level was categorized into four levels as follow: Novice (Mean= 0-1.25), Beginner (Mean =1.26 -2.49), Competent (Mean = 2.5-3.49) and the Proficient (Mean = 3.5 above). The third part which is part C is weighted on 4 - point Likert scale. Mean and standard deviation were used to analysed the data. A mean of 2.50 above indicated the methods of teaching agree to develop entrepreneurial skills in pre-service teachers while mean less than 2.50 indicated a disagreement.

Results

Research Questions 1

Table 1: Frequency and percentage of respondents on entrepreneurial skills that can be acquired by university pre-service teachers through Physics education

S/N	Entrepreneurial skills in Physics	F	%	Decision
1.	Vulcanizing	84	66.67	Acquired
2.	Tailoring	92	73.01	Much Acquired
3.	Plumbing	67	53.17	Acquired
4	Auto mechanic	75	59.52	Acquired
5	Phone repair	78	61.90	Acquired
6	Electrical Installation	91	72.22	Much Acquired
	Battery Charging			
7	Photography	40	31.75	Not Acquired
8	Automobile Rewiring	63	50.00	Acquired
9	Generator Repair	72	57.14	Acquired
10.		85	67.46	Much Acquired

According to Table 1, the entrepreneurial skills that pre-service university teachers can acquire through Physics education include vulcanizing (66.67%), tailoring (73.01%), plumbing (53.17%), auto mechanics (59.52%), phone repair (61.90%), electrical installation (72.22%), photography (50.00%), automobile rewiring (57.14%), and generator repair (67.46%). The skill of battery charging was not acquired by the majority of the respondents, indicated by the low percentage (31.75%). This shows that majority of the entrepreneurial skills can be acquired through Physics education.

Research Question 2

Table 2: Mean Distribution of respondents on level of Competencies

S/N	Competencies	N	Mean	Std. Deviation	Decision
11	Vulcanizing	126	1.12	0.39	Novice
12	Tailoring	126	3.73	0.64	Proficient
13	Plumbing	126	1.86	0.45	Novice
14	Auto mechanic	126	1.25	0.95	Novice
15	Phone repair	126	1.17	0.37	Novice
16	Electrical Installation	126	2.40	0.87	Beginner
17	Battery Charging	126	1.87	1.10	Novice
18	Photography	126	2.69	2.95	Competent
19	Automobile Rewiring	126	1.04	1.20	Novice
20	Generator Repair	126	1.53	0.50	Novice

Table 2 shows entrepreneur skills where pre-service Physics teachers' have competencies. The result showed that only two (Tailoring & Photography) out of 10 items have mean values above 2.5 benchmark mean on 4-point Likert scale. This indicates majority of the pre-service

university teachers have no competency in most of the identified entrepreneurial skills. This result indicated that pre-service Physics teachers are primarily novices in several entrepreneurial skills, with just two areas where they exhibit higher levels of proficiency and competency.

Research Question 3

Table 3: Mean and Standard Deviation of the Method for the Development of Entrepreneurial Skills through Physics Education

S/N	Methods of Developing Entrepreneurial Skills	$\bar{X}$	SD	Decision
21	Guided Discovery Method	3.47	0.70	Agree
22	Problem solving Method	3.30	0.60	Agree
23	Lecture Method	1.91	0.39	Disagree
24	Practical Activity-based Method	3.14	0.48	Agree
25	Learners Centered Method	3.50	0.62	Agree

Table 3 shows the effectiveness of various methods for developing entrepreneurial skills in Physics education. The Guided Discovery Method (M = 3.47, SD = 0.70), Problem Solving Method (M = 3.30, SD = 0.60), Practical Activity-based Method (M = 3.14, SD = 0.48), and Learner Centered Method (M = 3.50, SD = 0.62) were agreed upon as effective methods. The Lecture Method (M = 1.91, SD = 0.39) was disagreed upon as an ineffective method.

Discussion of Findings

This study revealed that most of the entrepreneurial skills itemized in Table 1 could be acquired by Physics students. Specifically, skills such as vulcanizing, tailoring, plumbing, auto mechanics, phone repair, electrical installation, photography, automobile rewiring, and generator repair were identified as acquired by a significant percentage of respondents. This finding aligns with the work of Okafor (2019), who emphasized that many Physics topics facilitate the acquisition of entrepreneurial skills. Therefore, identifying more entrepreneurial skills within the Physics curriculum can enable students to diversify their skill sets, foster self-reliance and wealth creation for themselves and others. The entrepreneurial skills acquired through Physics education could significantly contribute to wealth creation.

However, the study found that the competency levels of pre-service Physics teachers in

these entrepreneurial skills were generally low, with many students classified as novices in key areas such as vulcanizing, auto mechanics, phone repair, and automobile rewiring. This lack of competency may hinder students' ability to generate income, become self-employed, or achieve self-reliance. This finding contrasts with the study by Egolum and Chukuma (2013), which revealed that students had moderate competencies required for entrepreneurial skill acquisition. Therefore, it is essential to provide training and mentoring to pre-service teachers in their acquired entrepreneurial skills to commercialize these skills and generate income effectively.

The methods used in teaching Physics can significantly foster the development of entrepreneurial skills among students. Methods such as guided discovery, problem-solving, and practical activity-based learning were found to be effective in developing entrepreneurial skills, as indicated in Table 3. These methods can help pre-service teachers identify and acquire entrepreneurial skills, recognize opportunities in their environment, and lead to self-empowerment and national development. This finding supports the views of Nwoye (2012) and Okafor (2019), who opined that practical activities, problem-solving, and guided discovery significantly contribute to the development of entrepreneurial skills in Physics students. However, the lecture method should not be solely relied upon in teaching Physics, as it was found to be less effective in developing entrepreneurial skills.

Conclusion

Physics education has the potential to equip university pre-service teachers with a wide range of entrepreneurial skills. Inspite of the acquisition of these skills, the competency levels among students were generally low, with many classified as novices. This lack of sufficient competency may limit pre-service teachers' ability to commercialize and effectively generate income, become self-employed, or achieve self-reliance. Effective teaching methods, such as guided discovery, problem-solving, and practical activity-based learning, were identified as crucial for the development of these entrepreneurial skills, while the lecture method was found to be less effective.

Recommendations

1. Physics education curriculum should be revised to include more entrepreneurial skill-based topics and practical activities. This will allow pre-service teachers to diversify and commercialize them.
2. To improve competency levels, it is essential to provide training and mentoring programs

for pre-service teachers. These programs should focus on practical, hands-on experiences that allow pre-service teachers to develop and refine their entrepreneurial skills.

3. Teachers should prioritize teaching methods that have proven to be effective in developing entrepreneurial skills, such as guided discovery, problem-solving, and practical activity-based methods. These methods should be integrated into the Physics curriculum to enhance skill acquisition and competency.

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