CUSTECH INTERNATIONAL JOURNAL OF EDUCATION, VOL.1, NO. 2, DECEMBER, 2024
http://custechijoe.org.ng
ISSN 1595-1839

IDENTIFICATION OF PHYSICS-RELATED ENTREPRENURIAL SKILLS BY PHYSICS EDUCATION STUDENTS FROM SENIOR SCHOOL PHYSICS CURRICULUM IN NORTH-CENTRAL, NIGERIA

BY
ADENIYI, GLORIA IBIDUN, AKANBI ABDULRASAK OLADIMEJI-PhD AND RIDWAN ENUWA MOHAMMED-PhD
Department of Science Education,
University of Ilorin

Corresponding Author: niyigloria @gmail.com

Abstract
Unemployment has contributed to the poor economic situation in Nigeria which has made the citizens to drown in poverty. One way minimise the level of unemployment is to embrace entrepreneurship. This study identified the entrepreneurial skills related to Physics topics from the senior secondary school curriculum. The study was descriptive research. Sample population comprised 704 undergraduate physics Education students from North-Central universities in Nigeria. Questionnaire was used as research instrument containing 20 Physics topics and the entrepreneurial skills. Purposive sampling was used to select universities that run Physics Education as a course while the selected universities were stratified into federal, state and private. Physics students were selected using convenience sampling technique. Two research questions were answered using percentage, mean and standard deviation and one research hypothesis was tested at .05 level of significance using t-test. The result revealed that Physics Education students were able to identify Physics related entrepreneurial skill. Also, there is no significant difference in the identification of Physics-related entrepreneurial skills based on gender. Some recommendations were made to this effect.

Keywords: Identification, Entrepreneurial Skills. Physics-Related

Introduction

Entrepreneurship is a process of identifying opportunities and discovering of ideas that can lead to wealth creation in order to alleviate poverty and unemployment. Unemployment has been a major challenge among Nigerian youth. Agommuoh and Ndirika (2017) opined that one of the ways to come out of unemployment and poverty is to embrace entrepreneurship. It was posited by Hamed et al. (2023) that entrepreneurship should be included into science education so as to foster creativity and innovation among students.

Physics is one of the pure science subjects that 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 intended at training students to acquire good understanding of the 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, Medicine among others) as fundamental means of recognizing opportunities which can translate to wealth generation and alleviate poverty rate. This implies that Physics education students 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 livelihood (Badmus & Omosewo, 2018) hence, a reduction in the rate of unemployment and poverty level. Entrepreneurship education is a way of acquiring knowledge and skills that empowers an individual to live a fulfilled live (Okafor, 2019). It involves transforming ideas, knowledge and skills to new opportunities inform of goods (products) and services for man's beterment. 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 of Physics who had gone through entrepreneurship education, should be able to identify scientific activities that can foster entrepreneurial skills and commercialized predictable business opportunities which might help them to secure job or create job after school and become self-reliant thereby reducing poverty. Identification of entrepreneurial skills is the capability of students o discover entrepreneurial opportunities through provision of goods and services. Nwoye and Okafor (2019) surveyed entrepreneurial skills acquisition among secondary school physics students and found that there was a a low acquisition of entrepreneurial skills among physics probably due to poor identification. However, Naade et al. (2023) identified 11 physics topics that facilitates entrepreneurial skills. It was revealed that entrepreneurial skills such as generator repair, electrical installation, house wiring among others were acquired by physics students. Also, Budi and Farcis (2021) examined critical thinking ability in students' innovation and problem-solving skills in physics entrepreneurship. The result revealed low identification of critical thinking and problem-solving skills. D'Este et al. (2009) examined that factors that helps in sharpening entrepreneurial opportunity

identification and reported that prior entrepreneurial experience and engagement in scientific activities helps to promote opportunity recognition. In the work of Oguezue et al. (2023) undergraduate students entrepreneurial based opportunities during strike action was examined and found that most undergraduate students see this as opportunity to engaged actively in entrepreneurial skills such as tailoring, soap making, solar panel installation among others. Furthermore Okafor (2019) has been able to list physics topics that can facilitate entrepreneurial skills in Physics and found that 39 0ut of 48 physics topics can facilitate the entrepreneurial skill acquisition. Based on the previous researches, it has been established those entrepreneurial skills are embedded in the Physics curriculum. This paper therefore, examined the entrepreneurial skill related to physics topics. Undergraduate Physics students were exposed to wide range of entrepreneurial skills and are expected to choose the correctly related skill to each topic. Gender is another variable considered in this study. A study was conducted on gender inequality in Science, Technology, Engineering and Mathematics (STEM) education towards sustainable development by Agommuoh and Ndirika (2017). the study involved 28 female and 39 male teachers. It was found that there was no significant difference in the views of the teachers.

Purpose of the Study

The study specifically sought to

1. Identify the Physics related entrepreneurial skills acquired by undergraduate Physics education students.
2. Examine the difference in the undergraduate Physics Education students' identification of physics–related entrepreneurial skills based on gender?
3.

Research Questions

1, what are the physics-related entrepreneurial skills identified by undergraduate Physics education students from senior school curriculum?

2. What is the difference in the undergraduate Physics Education students' identification of Physics-related entrepreneurial skills based on gender?

Research Hypothesis

H_{O1}:There is no significant difference in the undergraduate Physics Education students; identification of Physics related entrepreneurial skills based on gender.

Methodology

This study is descriptive research of the survey type. The study was carried out in North- Central Geo-Political zone of Nigeria. This zone comprises of six states. All undergraduate Education students formed the population for the study. The target population was all undergraduate science education students while 704 Physics Education students constituted the sample size. The universities that participated in this study were purposively selected. Purposive sampling technique was used

because not all universities offer Physics Education programme. The universities were stratified into federal, state and private universities. Four federal universities, three state universities and one private university were selected. Convenience sampling technique was used to select Physics Education students who were accessible as at the time of administration of the research instrument.
Questionnaire was used as research instrument titled "Identification of Physics – Related Entrepreneurial Skills Questionnaire"(IPS-Q). The questionnaire contains 20 physics topics where each topic has three entrepreneurial skills attached to it inform of multiple choice. One correct option which related to the physics topic and two incorrect options not related to the physics topic. Students were asked to identify the correctly related entrepreneurial skill. The face and content validity of the research instruments was done by three lecturers. One from the department of science education and two from educational management, university of Ilorin. The observation and correction were used to modify the research instrument. The instrument was trial tested on 20 undergraduate Physics education students in a state university that did not take part in the main study. Cronbach alpha was used to test the internal consistence of the research instrument and was yielded reliability index of 0.86 which shows that the instrument is reliable. Percentage was used to answer research questions while t-test was used to analyzed the hypothesis.

Results

Research question 1: What are the physics-related entrepreneurial skills identified by undergraduate Physics education students from senior school curriculum?

Table 1:
Entrepreneurial Skills in the Senior School Physics Curriculum

S/N	Physics Topics	Entrepreneurial skills	%Right	%Wrong	Tick the correct skill
1	Measurement and Units	a. Photography b. Tailoring c. Vulcanizing	86.06	13.94	Correct
2	Heat Energy	a. Electrical installation b. Tiling c. Vulcanizing	27.10	72.90	Wrong
3	Motion	a. Web Designing	73.12	26.88	Correct

		b. Computer Programming c. Driving of automobile			
4	Fluid at rest and in motion	a. Plumbing b. welding c. Generator repair	56.25	43.75	Correct
5	Electric field	a. Automobile mechanic b. Optical Services c. House wiring	71.73	28.27	Correct
6	Gravitational field	a. Installation of Satellite Dishes b. Photography c. Painting	81.51	18.49	Correct
7	Solar Collector	a. Generator repair b. Solar panel Installation c. Electroplating	76.70	23.30	Correct
8	Projectile	a. Sporting b. Automobile rewiring c. Tiling	69.33	30.67	Correct
9	Semiconductors	a. Plumbing b. Carpentry c. Radio/TV repair	72.73	27.27	Correct
10	Gas Laws	a. Carpentry b. Phone repair c. Production of Gas cylinder	71.02	28.98	Correct
11	Pressure	a. Pipe-fitting b. Production of syringe c. Painting	53.41	46.59	Correct
12		a. Lens services	73.40	26.60	Correct

	Equilibrium in Liquids	b. Refrigerator repairs c. Local boat production			
13	Light waves	a. Painting b. Household wiring c. Photography	83.64	16.36	Correct
14	Sound waves	a. Photography b. Welding c. Production of musical instrument	86.77	13.23	Correct
15	Human Eye	a. Pipe fitting b. Optical lens services c. Plumbing	83.40	16.60	Correct
16	Electromagnetic Field	a. Welding b. Mechanic c. Painting	66.24	33.76	Correct
17	Energy Quantization	a. Solar panel installation b. Auto mechanic c. House wiring services	5.00	50.00	Correct
18	Simple A. C Circuit	a. Electroplating b. Automobile alignment c. House wiring	67.05	32.95	Correct
19	Conduction through liquids and gases	a. Vulcanizing b. Production of battery c. Web Designing	74.64	25.36	Correct
20	Nuclear Physics	a. Production of electricity b. Car alignment c. Installation of fire alarm	58.45	41.55	Correct

Table 1 shows the results of identified entrepreneur skills in the senior secondary school physics curriculum by students. Out of the 20 physics topics with their sub-topics listed in table 1, 19 topics with their sub-topic were correctly identified with the majority had correct responses, while only one (1) topic with its sub-topic was not identified correctly, that is: Heat Energy. The topics like the following were identified correctly: Measurement and Units, Motion, Fluid at rest and in motion, Electric field, Gravitational field, Solar Collector, Projectile, Semiconductors, Gas Laws, Pressure, Equilibrium in Liquids, Light waves, Sound waves, Human Eye, Electromagnetic Field, Nuclear Physics, Simple A. C Circuit, Conduction through liquids and gases, and Energy Quantization. This indicates that students can acquired conveniently the identified the entrepreneurial skills from the senior school physics curriculum.

Research Question 2: What is the difference in the undergraduate Physics Education students' identification of Physics-related entrepreneurial skills based on gender?

Table 2:
Gender Distribution

Gender	Frequency	Percentage
Male	449	63.78
Female	255	36.22
Total	704	100

Table 2 showed that the majority of the respondents were male with 449(63.78) respondents, while their female colleagues were 255(36.22) respondents.

Hypothesis: There is no significant difference in the undergraduate Physics Education students; identification of Physics related entrepreneurial skills based on gender.

Table 3:
t-test Results for Identification of Physics-Related Entrepreneurial Skills

Gender	N	Mean	Std. Deviation	t	Df	Sig. (2-tailed)	Remark
Male	449	31.76	4.00	-1.29	702	.20	NS
Female	255	32.20	5.12				

Discussion of Findings

The result of this STUDY showed that Undergraduate Physics Education students were able to identify physics -related skills except for one topic (Heat Energy). Entrepreneurial skills identified were: photography, house wiring, solar panel installation, tailoring, pipe fitting, lens services among others. This is in agreement with Naade et al. (2023) and Okafor (2019) who identified 11 entrepreneurial skills in physics and Identified Physics topics that could facilitate acquit ion of entrepreneurial skills. The reason for the identification could be that the instrument has avail the students opportunities think and link physics to entrepreneurship. The implication is that students will be fully aware of opportunities that could create wealth. This will boost their sense of opportunity recognition when Physics is taught. Students may begin to think out the classroom lesson hence moving from theory to application of the Physics concepts. Moreso, both male and female Physics education students were able to identify physics related entrepreneurial skills. This is in line with the work of Agommuoh and Ndirika (2017) who revealed that there was no significant difference in the way male and female teachers view entrepreneurial skills for sustainable development. This could be traced to probably the uniformity in Physics curriculum.

Conclusion

Physics has several entrepreneurial skills that can generate income for individual. With the study of Physics, graduates of Physics education can not be jobless because teaching profession is seen as a stream of income and entrepreneurial skills identified in Physics becomes additional source of income which will go along way to reduce poverty.

Recommendations

1. Lecturers/ teachers should teach Physics in a way that students can embrace entrepreneurship.
2. Product based projects/ assignment should be given to students to arouse their interest in participating in entrepreneurship.
3. Teachers should link topics to skill acquisition during lesson.

References

Agommuoh, P. C. & Joseph-Kalu, N (2020). Acquisition of entrepreneurial skills: A pedagogical re-orientation for Physics teachers. *Rivers State University Journal Education (RSUJOE).*

Agommuoh, P. C. & Ndirika, M (2017). Strategies for promoting entrepreneurial skills in science education students for poverty eradication. *Journal of Research and Method in Education,* 7(3), 45-49 . DOI: 10.9790/73888-0703014549.

Anchor, E. E. & Wilfred-Bonse, U. K. (2013).The need to integrate entrepreneurship education into science education teachers' curriculum in Nigeria .*Journal of Science and Vocational Education, 7,* 111-123.

Badmus, O. T & Omosewo, E. O. (2018). Improving science education in Nigeria: The role of key stakeholders: *European Journal of Health and Biology Education, 7 (1),* 11-15 https://doi.org/10.29333/ejhbe/87086

Budi, G. S.& Farcis, F. (2021). Students' critical thinking skills innovating problem solving in the physics entrepreneurship course. *Berkala llmiahPenddidikan, 9 (1),* 39-46

D'Este, C. P. Mahdi, S. & Neely, A. (2009). Academic entrepreneurship: what are the factors shaping the capacity of academic researchers to identify and exploit entrepreneurial opportunities.URL https://hdl.handle.net/10261/20471

Hamed, A. E., Mohamed, R. Leonardo, P, Donatella, S., Abdullahi, L & Mahmoud, M. S (2023). Integrating entrepreneurship into Chemistry Education- Cairo University post graduate students' case study. *Insight in Regional Development, 5 (2),* 72-82. DOI: 10.9770/IRD.2023.5.2 (5)

Lameed, S. N., Adam, U. A., Bankole, I. S., Braimoh, D, S., & Chukwulobe, I. E (2024). Undergraduate science education students' awareness of prospects in STEM education to combat poverty. *Educational Perspectives, 12 (2),* 1-8

Naade, N., Allison, M. T.& Adolphus, T. (2023). Entrepreneurial skills in Physics: evaluating secondary school Teachers and students experiences in secondary schools in Rivers state. *Rivers State University Journal of Education, 26 (2),* 216-229. https://rsujoe,com.ng/index.php/joe/article/view/180

Nwoye, A. N (2012). *Assessment of resources and the level of entrepreneurial skill acquired by secondary school physics students in Anambra State.* Master Degree thesis. Department of Science Education, Nnamdi Azikiwe University, Akwa.

Nwoye, A. N & Okeke, S. O. C (2019). *Entrepreneurial skills acquired by secondary school physics students in Anambra state for self-reliance.* Department of Science Education, Nnamdi Azikiwe University. https//wwwreseachgate.net/publication/ 331021547.

Oguezue, N., Nwune, E. C & Chukwuedo, O. (2023). Investigation assessment of opportunity based entrepreneurial skills acquisition of students in tertiary institutions during ASUU strike. *International Journal of entrepreneurship Sustainable Studies, 3 (1),* 146-156. https://doi/10.31098/ijeass.v3i1.1530

Okafor, T. U. (2019). Identification of physics contents that can promote entrepreneurial skills among senior secondary physics students. *Nnadiebube Journal of Education in Africa, 3 (2)*, 39-51

Shehu , U. I.,Yohanna, I .M. & Ayodele, G. F. (2017). The role of Physics in the socio –economic-empowerment of society. The Nigerian Experience. *STAN 60th Anniversary Conference proceedings.*