ENHANCING ENTREPRENEURSHIP OPPORTUNITIES THROUGH CHEMISTRY EDUCATION: IMPLICATION FOR NIGERIA YOUTH EMPOWERMENT IN THE 21st CENTURY

Anselem Abonyi UGWUANYI, Ph.D.,
Department of chemistry, Federal College of Education, Abeokuta, Ogun, State, Nigeria,
anselemabonyi@gmail.com
Monisade Folashade ADERANTI, Ph.D.,
Department of chemistry, Federal College of Education, Abeokuta, Ogun State, Nigeria.
monisadeaderanti@gmail.com

Abstract: *The study investigated enhancing entrepreneurship opportunities through chemistry education: Implication for Nigeria youth empowerment in 21st century. Three research questions with their corresponding null hypotheses guided the study. A quasi-experimental, non-randomized control group design was adopted in three intact groups. population of this study was 954 SS 3 chemistry students in Odeda Local Government Area. A sample of 142 chemistry students was drawn using a purposive and simple random sampling techniques from three (3) out of 18 public schools in the LGA. Three intact classes were randomly assigned experimental groups (two classes) and control group (one class). Both experimental and control groups were subjected to pre-and post-testing. A 20-item tagged "Chemistry Practical Skills Acquisition on Soap and Detergent Production" (CPSASDP) structured on a 4-point rating scale developed by the researchers was the instrument used for data collection. It was validated by three experts in chemistry education and measurement and evaluation. The reliability estimate was computed using Cronbach's Alpha with coefficient index of 0.75. The three groups were taught the same concepts, but with different instructional arrangement. Data collected were analyzed using mean and standard deviation to for answering research questions and Z-test for answering the null hypotheses at 0.05 level of*

significance. The results revealed that both entrepreneurial skills engagements enhance skills acquisition if appropriately handled. In addition, the hypotheses were accepted because they only differed in their mean score differences. Based on the results, it was recommended among others that students should apply the skills acquired in Chemistry practical to enhance their entrepreneurship development.

Keywords: *entrepreneurship; chemistry education; empowerment.*

Introduction

The assurance of Nigeria government providing white-collar jobs for the unemployed youths has become a very difficult problem. This has caused serious threat of increasing unemployment rate. This situation calls for a serious paradigm shift for out of school or graduate to plan for a life-long survival. This rethinking is in line with the National policy on education (FRN, 2013, P. 12) where in the policy framework no (d), it states that an individual is to acquire appropriate entrepreneurial, technical and vocational job-specific skills for self-reliance and for agricultural, industrial, commercial and economic development as equipment for problem solving for the individual and the society general. This policy framework was timely enough as indicator that government is not capable of meeting the need and aspiration of the graduate youths. It was a timely policy, hence the need to find alternate means of reducing the high rate of unemployment in the time of failure on the part of government to meet its responsibility. As a result of this, the youth should be away of what is ahead of them. At this point, there is need for alternative means of survival through self-employment and self-fulfilment for the teaming youths. This implies that the Nigerian youths can no-longer depend on the nation's labour market for job after graduation. The situation has made it possible for realization of the emphasis of the policy on the need to device an alternative source of employment, that is, self-reliance to become the only hope to alleviate the ugly state.

This means that the unemployed youths have to be an entrepreneur. An entrepreneur is an initiator who designs, organizes and creates something new. This can be acquired through entrepreneurship education or apprenticeship. Conceptually, entrepreneurship education according to Albert and Poli (2017), is a formal conveyance of entrepreneurial skills competences, which in turn refers to as concepts, skills and mental awareness used by individuals during the process of starting and developing their growth-oriented ventures. To achieve this,

the individuals must acquire the needed skills to succeed in teaching of science related business opportunities. The entrepreneurial skills are basic skills necessary to start, develop and make future survival in business. It is on this premise, that, the Federal Republic of Nigeria (FRN, 2008), in her policy strategy for education, directs teachers to make curriculum a worthwhile avenue for learner–centered, activity based and practical work oriented. It emphasised on acquisition of entrepreneurial skills in every part of concepts that are practically based for the benefit of individual, school and society. In line with this, Agi (2019) confirmed that entrepreneurship education should aim at producing students with the knowledge and skills, capacities and attitudes to create visions for different and better system of doing things. Hence its broad objectives as pointed by Osuala (2019) are;

i. To provide meaningful education for youth which could make them self- reliant and subsequently encourage them to drive profit and be self -independent.
ii. To provide graduates with the training and support necessary to help establish a career in small and medium size business.
iii. To provide graduates with training skills that will make them meet the manpower needs of the society.
iv. To provide graduates with enough training in risk management and to make uncertainty bearing possible and easy.
v. To stimulate industrial and economic growth of rural and less develop area.
vi. To provide graduates enough training that will make them creative and innovative in dabbling into new business opportunity.

For the past decades, these objectives were ignored, until in the recent time where graduates could no longer get employment immediately due to their unskilled potential (Millennium Development Goals, 2015). This led into many venturing in entrepreneurial development; unfortunately, they are not properly equipped, nor prepared to face the challenges of the new survival. Of course, this informed the nature of the colonial inheritance that our curriculum was tailored to produce "job seekers" and not "job creators". To produce a job creator, the classroom instruction needs to have the 21st century skills. The implementer of the curriculum, the teachers need to have the spirit of entrepreneurial skills. Especially, the chemistry teachers need such skills to facilitate all the process embodied in the chemistry curriculum. The chemistry curriculum is quite rich with the necessary process skills (Dike & Williams, 2018). It is possible for the chemistry teachers to teach students effectively in a way that, the students will be

self- reliance and use the knowledge to make a living for themselves. Nancy (2020), posits that chemistry teaching program prepares students entrepreneurship relevance through laboratory activities, product making activities etc. These activities are planned to develop in students the needed self -reliance for future risk taking. The skills that can facilitate this classroom development are expected to be acquired through training in the school laboratory; guided by qualified teachers. The motivating factor is the expectation by the learner in making a fortune out of the entire experience. Obi (2021) pointed out that this leads to entrepreneurial engagement, where the aim is to improve individual investment opportunities and contribute to the development of the society. The individual should bear in mind that essentially, it involves creative risk taking, perseverance, innovativeness and problem-solving. It is all about showcasing the latent skills or talents and untapped creative abilities, by contributing effectively to the development of the society.

The period of cognitive development only should be backed with real oriented practicality which help in developing the psychomotor skills. It is quite unfortunate that most of the science teachers to guide the leaners are pay less attention in developing the skills, couple with lack of the necessary facilities to work with. The worst implication is that the graduates of the present school system lack the creative ability to stimulate critical thinking, besides the use of skills to create entrepreneurial oriented venture. The only inherent problem, pointed out by Onyirioha and Amina (2020) is the teaching of chemistry in schools using inappropriate methods, which have failed to expose students to economic relevance of chemistry and to develop in the students' the skills embedded in chemistry curriculum. The situation calls for urgent need, to seek the services of a trained entrepreneur as resource person, possibly as adjunct instructor to complement the efforts of the serving teachers, particularly chemistry or science related teachers. This would in no small measure boost the guided inquiring-oriented coaching needed for a successful breed of entrepreneurs. The work of Lev Vygostsky's social constructivist learning theory (1969) in his learning experience cited in Kalu and Neji (2021) is quite relevance to this study. The theory explicitly explained that learning occurs in social context and in an interaction phase with others. The pyramid of learning experience shows in hierarchical percent as remembering shares only 10% of what an individual reads, 20% of what is heard, 30% of what it is seen, 50% of what is heard and seen, 70% of what it says and 90% of what it is said and do. Of course, what the activity-based learning focus is students' involvement in what it is said and do in the laboratory practices.

Through these entrepreneurial skills are acquired, offering a paradigm shift that differs from the normal conventional cognitive skills that depend only on the bookish syndrome that most science teachers adopt.

Statement of the problem

Despite all efforts to produce secondary school graduates that could be self-sustained, particularly, as it was emphasized and provided in the National policy on education (FGN, 2013), stressing graduates at all level to be self-reliance. It appears there is no remarkable impart. Could it be that the teachers are not well prepared for this task? Could we go back to seek the services of private entrepreneurs to support the teachers as resource persons? If these are possible options for a successful self-reliance of present graduates, based on this, the study tried to find out how effective this could be achieved.

Hinged on these, this study tends to investigate the enhancing entrepreneurship opportunities through chemistry education: Implication for Nigeria youth empowerment in 21st century in Odeda Local Government Area. Specifically, the study was intended to find the:

1. level of chemistry students' acquisition entrepreneurial skills taught by resource entrepreneur
2. level of chemistry students' acquisition entrepreneurial skills taught both successful entrepreneur and chemistry teacher.
3. level of students' entrepreneurial skills acquisition when taught chemistry by chemistry teacher.

Research Questions

1. What is the level of chemistry students' acquisition entrepreneurial skills taught by resource entrepreneur?
2. What is the level of chemistry students' acquisition entrepreneurial skills taught by both resource entrepreneur and chemistry teacher?
3. What is level of chemistry students' acquisition entrepreneurial skills taught by chemistry teacher?

Hypotheses

HO_1: There is no significant difference in the level of chemistry students' acquisition of entrepreneurial skills taught by resource entrepreneur and chemistry teacher.

HO_2: There is no significant difference in the level of chemistry students' acquisition of entrepreneurial skills taught by resource entrepreneur and both entrepreneur and chemistry teacher.

HO_3: There is no significant difference in the level of chemistry students' acquisition of entrepreneurial skills taught by chemistry teacher and both entrepreneur and chemistry teacher.

Methodology

The design adopted for this study is the quasi-experimental in the type of pretest-post-test control nonrandomized group design. The study was conducted in Odeda Local Government Area of Ogun State. The study population comprised all the senior secondary school II chemistry students in Odeda Local Government Area of Ogun State. The population comprised of all chemistry students (numbering 954 students) in 18 public secondary schools in Odeda L.G.A. (Source: Teaching Service Commission, TSC, 2022). A sample of 142 chemistry students was drawn from three (3) schools out of the 18 public secondary schools in Odeda L.G.A. The three (3) schools had 3 chemistry intact classes and the study was carried out in their second term, when all the students had chosen their subjects combination for West African School Certificate Examination (WASCE). The number of chemistry students in the class in each school was made available by the Head of Science Discipline (HSD) in each school. Two schools were assigned as experimental groups (A and B). The "A" group comprised (44) students taught by resource entrepreneur, group "B" 42 students taught by both resource entrepreneur and the chemistry teacher, while group C, comprised (56) students the control group was taught by the chemistry teacher. The three groups were taught the skills required for entrepreneurial development of soap and detergent production. The experimental groups involved the entrepreneur by practically following the procedures as in the case of (A) soap. (Modified procedure by (Olotu & Ugwuanyi, 2017), as:

i. Addition of oil to a bigger container
ii. Addition of Sodium silicate
iii. Addition of colourants
iv. Stirring very well
v. Addition of dissolved Caustic Soda to the mixture with stirring
vi. Addition of essential oil
vii. Pouring of the soap to the mould to set overnight
viii. Slicing to bar or tablet after a day when the soap is hardened
ix. Labelling of soap for use.

Acquired skills

- Measuring
- Controlling variables
- Observation

- experimenting
- Classification

B. detergent production

i. Boiling of oil till it is white.
ii. Allowing the boiled oil to cool
iii. Addition of soap dye after cooling the oil
iv. Stirring the mixture
v. Addition of caustic soda to water with stirring
vi. Allowing the solution of caustic soda to cool
vii. Addition of caustic Soda mixture to the oil mixture
viii. Addition of essential oil
ix Stirring the entire mixture very well
x. Pouring the mixture to mould to harden
xi. Grating to powder when purely hardened

The skills involved

- Experimenting
- Controlling variables
- Measuring
- Observation
- Classification

The instrument for data collection was a Chemistry Practical Skills Acquisition on Soap and Detergent Production (CPSASDP) adapted by the researchers. The CPSASDP consisted of 20 items multiple choice students' acquisition of entrepreneurial skills, which carries 4 marks each, totaling minimum of 20 and maximum of 80 scores. The CPSASDP served as pretest and post-test for the 3 groups to measure students' acquisition of entrepreneurial skills. The instrument was validated by three experts in chemistry education and measurement and evaluation Department of Science Education University of Nigeria, Nsukka. The reliability estimate was computed using Cronbach's Alpha with coefficient index of 0.75. adjudged reliable at 0.75. The index showed that the instrument was suitable for the study. Mean and standard deviation were used to analyze the research questions, while Z – test was used to analyze the hypotheses at 0.05 level of significance.

Results

Research Question One: What is the level of chemistry students' acquisition entrepreneurial skills taught chemistry by resource entrepreneur?

Method		Pre-test		Post-test		Mean Gain
	N	$\bar{X}$	SD	$\bar{X}$	SD	scores
Guided by Entrepreneur	44	1.67	0 .72	3.19	0 .44	1.52

Table 1: Mean and standard deviation of level of chemistry students' acquisition of entrepreneurial skills taught chemistry by resource entrepreneur

The data presented in table 1 shows that chemistry students taught by resource entrepreneur had a mean gain score (1.52) and standard deviation of 0.72 and 0.44 for pretest and post-test respectively. The instructional method showed enhancement in their acquisition of entrepreneurial skills in chemistry considering the initial baseline compared to the post test performance.

Research Question Two: What is the level of chemistry students' acquisition entrepreneurial skills taught by both resource entrepreneur and chemistry teacher?

Method		Pre-test		Post-test		Mean Gain
	N	$\bar{X}$	SD	$\bar{X}$	SD	scores
Both (Methods)	42	2.00	0 .82	3.10	0 .49	1.10

Table 2: Mean and standard deviation of level of chemistry students' acquisition entrepreneurial skills taught by both resource entrepreneur and chemistry teacher

The data presented in table 2 reveals that chemistry students guided by entrepreneur and chemistry teacher had a mean gain score (1.10) and standard deviation 0.82 and 0.49 for pretest and post-test respectively. The instructional method showed enhancement in their acquisition of entrepreneurial skills in chemistry considering the initial baseline compared to the post test performance.

Research Question Three: What is level of chemistry students' acquisition entrepreneurial skills taught by chemistry teacher?

Method		Pre-test		Post-test		Mean Gain
	N	$\bar{X}$	SD	$\bar{X}$	SD	
scores						
Guided by Chemistry teacher	56	1.70	0.90	3.33	0.41	1.63

Table 3: Mean and standard deviation of level of chemistry students' acquisition entrepreneurial skills taught by chemistry teacher

The data presented in table 3 indicates that group taught by chemistry teacher alone had a mean gain score (1.63) with a standard deviation of 0.90 and 0.41 for pretest and post-test respectively. The instructional method showed enhancement in their acquisition of entrepreneurial skills in chemistry considering the initial baseline compared to the post test performance.

Hypothesis One: There is no significant difference between students taught chemistry entrepreneurial skills by resource entrepreneur and those taught by chemistry teacher.

Method	N	Mean	SD	Z-cal	Z-critical	Decision
Resource entrepreneur	44	3.19	0.44	.63	1.96	accepted
Chemistry teacher	56	3.33	0.41			

Table 4: Z-test comparison of mean scores of chemistry students' acquisition of entrepreneurial skills taught by resource entrepreneur and chemistry teacher.

From table 4, Z calculated value in respect of the instructional effects of integrating external entrepreneur and the chemistry teacher on the acquisition of entrepreneurial skills is 0.63 while the Z-critical value at 0.05 level of significance is 1.96. Thus, the Z-calculated value is less than the Z-critical value. The null hypothesis (H_{O1}) is therefore accepted. To this effect the researchers concluded that it does not matter how the students were exposed to entrepreneurial skills, either arrangement could enhance skills acquisition if appropriately handled.

Hypothesis Two: There is no significant difference between students taught entrepreneurial skills by successful entrepreneur and those taught by both conventional chemistry teacher and entrepreneur.

Method	N	Mean	SD	Z-cal	Z-critical	Decision
Resource entrepreneur	**44**	**3.19**	**0.44**	**0.86**	**1.96**	**Accepted**
Entrepreneur + Chemistry teacher	**42**	**3.10**	**0.49**			

Table 5: Z-test comparison of mean scores of students' acquisition of entrepreneurial skills taught by resource entrepreneur and those taught by both entrepreneur and chemistry teacher.

From table 5, Z calculated value in respect of use of entrepreneur resource and a combination of entrepreneur and chemistry teacher on the acquisition of entrepreneurial skills is 0.86 while the Z-critical value at 0.05 level of significance is 1.96. Thus, the Z-calculated value is less than the Z-critical value. The null hypothesis (H_{O2}) is therefore accepted. To this effect the researchers concluded that it does not matter how the students were exposed to entrepreneurial skills, either arrangement could enhance skills acquisition if appropriately handled.

Hypothesis Three: There is no significant difference between students taught entrepreneurial skills by chemistry teacher and those taught by both chemistry teacher and entrepreneur.

Method	N	Mean	SD	Z-cal	Z-critical	Decision
Chemistry teacher	**56**	**3.33**	**0.41**	**0.94**	**1.96**	**Accepted**
Entrepreneur + Chemistry teacher	**42**	**3.10**	**0.49**			

Table 6: Z-test comparison of mean scores of students' acquisition of entrepreneurial skills taught by chemistry teacher and those taught by both entrepreneur and chemistry teacher

From table 5, Z calculated value in respect of use of chemistry teacher and a combination of entrepreneur and chemistry teacher on the acquisition of entrepreneurial skills is 0.94 while the Z-critical value at 0.05 level of significance is 1.96. Thus, the Z-calculated value is less than the Z-critical value. The null hypothesis (H_{O3}) is therefore accepted. To this effect the researchers concluded that it does not matter how the students were exposed to entrepreneurial skills, either arrangement could enhance skills acquisition if appropriately handled.

Discussion

The findings revealed that all the instructional methods showed enhancement in their acquisition of entrepreneurial skills in chemistry considering their initial baseline compared to the post test performance. Although there was enhancement, further analyses revealed that there was no significant difference between one method and another. Thus, the null hypotheses (H_{O3} toH_{O3}) are therefore accepted. To this effect the researchers concluded that it does not matter how the students were exposed to entrepreneurial skills, either arrangement could enhance skills acquisition if appropriately handled. The results obtained are in line with the positions of Agi (2019) and Nancy (2020), that chemistry curriculum prepares students for entrepreneurship development, this takes place in the laboratory which the instructors prepare. To collaborate this fact, Dike and Williams (2018), affirmed the presence and inculcation of entrepreneurial skills in the curriculum. This means that, the classroom teacher's duty is to inculcate the embedded necessary process skills that will enhance individual entrepreneurial skills.

Conclusion

The results available from this study attested that chemistry teacher still adopt the necessary process skills as enshrined in the curriculum, the only thing requires of chemistry teacher in the classroom is to ensure that all the available and relevance skills necessary for science learning are applied towards a lifelong living. There is therefore the need to inculcate a positive perception of the learner towards personal survival through entrepreneurial skills enhancement.

Recommendations

Based on the outcome of the results, the following recommendations were made.

1. The students should apply the skills acquired in Chemistry practical to enhance their entrepreneurship development.
2. A retraining of chemistry teachers is recommended to update their knowledge of entrepreneurship skills development.
3. Parents should be involved in encouraging their children to improve entrepreneurially, by providing the necessary materials needed for their classroom experience.
4 Graduates at all levels should not shy away from local resource entrepreneurs as a way of showcasing their classroom knowledge in practical reality.

5. Chemistry teachers should be encouraged to use appropriate methods and skills that promote entrepreneurial skills enhancement.

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