

---

# DEVELOPMENT OF CREATIVITY/ENTREPRENEURIAL SKILLS AMONG SCIENCE EDUCATION STUDENTS: CHALLENGES AND PROSPECTS

---

**PROF. BENADETTE UGOCHI CHUKWUNEKE**  
*Department of Science Education, Madonna University,  
Nigeria, Okija Campus*

**DR.EUCHARIA NDIDI IKWUANUSI**  
*Department of Integrated Science, AIFCE Owerri*

And

**DR. SYLVESTER UGWU OZIOKO**  
*Department of Integrated Science, AIFCE, Owerri*

## Abstract

*The study was aimed at investigating the development of creativity/ Entrepreneurial skills among science Education students. The population of the study consists of all secondary schools in all the six Education zones in Anambra state. Simple Random Sampling with replacement was used to select the sample for the study made up of 330 STM teachers. Questionnaire was used for data collection. Two hypothesis were tested using t-test while three research questions were answered using mean and standard deviation. The result of the study shows that STM teachers are not prepared in the development of creativity/ Entrepreneurial skills among science Education students due to some challenges which includes unavailability of science equipment/ materials needed for teaching entrepreneurial skills. To move forward, the curriculum should be off-loaded with irrelevant content and redesigned to include entrepreneurial skill acquisition which seems to be lacking and laboratories and workshops to be properly equipped for practical.*

**Keywords:** Science, Technology, Mathematics, development, Creativity, Entrepreneurial Skill

## Introduction:

Creativity as the name implies, relates to or involve the use of imagination or original ideas in order to create something. The word creativity is derived from creativity and creativeness. Franken, (2007) defined creativity as the tendency to generate ideas,

***Development of Creativity/Entrepreneurial Skills among Science Education Students:  
Challenges and Prospects - Prof. Benadette Ugochi Chukwuneke; Dr. Eucharia Nnidi  
Ikvwuanusi and Dr. Sylvester Ugwu Ozioko***

---

alternatives or possibilities that may be useful in solving human problems, while google search on entrepreneurship definition sees creativity as the process of looking at things in such a way that possible solutions to problems and perceived needs may evolve in venturing. Naiman,(2007) looks at creativity as the process of bringing something new into being through the act of turning new and imaginative ideas into reality. This shows that creativity involves two processes: thinking and then production. If one has an idea but could not act upon it, it means that such individual is imaginative but not creative (Okoye & Eze, 2010). Thus creativity requires whole – brain thinking: right-brain imagination, artistry and left-brain intuition, including left-brain logic and planning (Amesi, 2011).

Based on these requirements that could enable someone become creative, there has been the strong belief that only special or talented people are creative and entrepreneurially skillful. However, research proved that anybody could become a successful entrepreneur and that anyone could be creative if:

- He has opportunities
- He is encouraged
- He receives training
- He is motivated and mentored ( Amesi & Akpomi 2018)

On the other hand, an entrepreneur is a person that is self- employed. Owner of small business firm may also be called an entrepreneur because they choose to assume risk, identify business opportunities, gather resources, initiate action and establish organization to meet the demand of the market opportunities (Nelson and Leach in Osuala, 2004). Also an entrepreneur is an individual who sees environmental change, as an opportunity and uses it to produce new goods and services. One important characteristics of an entrepreneur is that they possess the ability to cope effectively in ever changing situation. They have the ability to identify opportunities to which others are blind. They have an optimum confidence in themselves well beyond others. An entrepreneur can therefore be said to be a person that is determined (Chukwuneke, 2009).

Having entrepreneurial skill involves the acquisition of skills, ideas and managerial abilities necessary for self-reliance. It also involves the following:

- a. Identification of investment opportunities
- b. Decision making as to the opportunities to exploit, promote and establish
- c. Aggregation of scarce resources required for production and distribution
- d. Organization and management of human material resources for the attainment of the objective of the enterprise
- e. Innovation
- f. Risk bearing

It is therefore important to note that, creativity as a tool for the development of entrepreneurial skills should be properly emphasized in our science classrooms so as to eliminate ignorance and superstition, free our mind for quicker perception of issues, initiate inquiry, experimentation and innovation in Science Education.

Development of creativity among Science Education students as characteristics of entrepreneurs' success cannot be complete without the ability to assign a set of standard and addressing the mind towards accomplishing the set of goals amidst road blocks in the course of actualization (David 2008). An entrepreneur who wishes to succeed in his or her creative art must not listen to unnecessary criticisms and Cajole. He must be courageous to overcome shame at steps- attempt and also withstand flattering and Jest of his creative attempt.

Through Science Education, many scientists can be trained in line with the nation's progress towards the direction of science and Technology. Science subjects are seen as one of the important subjects in the development of creativity (Curriculum Development Council, 2002). As early as the 1980's, Comark and Yager (1989) has proposed a taxonomy of Science Education which included the domain of imagination and invention. Based on these taxonomies, Gilbert (1992) suggests six questions in the learning design. Question forms are integration, imagination, brainstorming, organizing, making and metaphors and conceptualizing. Aksoy (2005) found that science instructions, which is based on scientific process in creative thinking has increased the creative thinking level of the students, has improved their academic success level and has advanced their attitudes to the lessons in scientific knowledge acquisition: science process skills taught in schools is very important as it promotes the development of creative thinking and thus develop their potentials and opportunities in entrepreneurship education.

There are five types of nurturing creative learning activities in science classrooms, they are the discovery, understanding, presentation, application, and transformation of scientific knowledge. To get creativity through discovery activities, teachers can ask students to do independent research activities, or involve in divergent thinking, training of students in science process skills. Students, are encouraged to develop science in an interesting and diverse range of scientific observation, classification, questions on scientific research, forming hypothesis, using equipment and appliances and making conclusions from empirical data (cheng, 2011). To understand knowledge in a creative way, teachers can encourage students to seek new alternative examples, analogies, descriptions and explanations of a scientific theory or concept in the subject. Furthermore, teachers can encourage students to construct existing concept through exposure to ideas that conflict, engaging them in debate.

Creativity can be developed in science students through scientific knowledge in various forms. For example, knowledge, concepts and principles can be presented in the form of role playing, drama, music, pictures, poems, and stories. To foster creative knowledge, students are given a situation where they are given the opportunity to find

*Development of Creativity/Entrepreneurial Skills among Science Education Students: Challenges and Prospects - Prof. Benadette Ugochi Chukwunekę; Dr. Eucharía Nđidi Ikvwanusí and Dr. Sylvester Ugwu Oziokó*

---

new ways to explain the phenomena in science, to make predictions, to solve problems, to state or imply what is not known. (Cheng, 2011)

Science Education is the bedrock of technological breakthrough. Technologically advanced countries of the world attain their status through the stock of their science educators, scientists and technicians. Technological advancement is a must for any nation to rise above poverty and backwardness. It is a well known fact that no technologically advanced country is poor and no poor country is technologically advanced. This has a lot of implications for our Science Education (Onu, 2007). At the instance of this, the present study goes to find out the problems and prospects of development of creativity and entrepreneurial skills among science education students.

**Statement of the problem:**

Most Nigerian secondary education graduates do not possess the creativity/entrepreneurial skills that will enable them to be self-reliant and self-employed by establishing and managing small business enterprise after graduation. They are often unemployed because they do not possess adequate skills needed for self-employment. Unemployed youths are restive and constitute nuisance to the society. Therefore, there is urgent need for the integration of entrepreneurship education into science, technology and mathematics (STM) curriculum for secondary schools. This will enable the STM teachers to develop creativity/entrepreneurial skills in their students. Hence, it becomes imperative to find out how prepared the STM teachers are to live up to this responsibility. At the instance of this, the present study goes to investigate the preparedness of the STM teachers in developing creativity/entrepreneurial skills among science education students and also to determine the challenges and prospects of overcoming these challenges.

**Research Questions:**

The following research questions were answered in this study. They are as follows:

1. To what extent do the science educators prepared in the development of creativity/entrepreneurial skills among science students in secondary schools?
2. What are the problems to the development of creativity/entrepreneurial skills among secondary school science students?
3. What are the prospects for the development of creativity/entrepreneurial skills among secondary school science students?

**Hypothesis:**

The following null hypotheses were tested at 0.05 level of significance.

Ho<sub>1</sub>:

There is no statistically significant difference between the mean responses of female STM teachers and male STM teachers on the preparedness of STM teachers in developing creativity/entrepreneurial skills through STM education.

Ho<sub>2</sub>:

There is no statistically significant difference between the mean responses of female STM teachers and male STM teachers on the challenges to the acquisition of creativity/entrepreneurial skills through STM education by secondary school students in Anambra state.

### **Methodology:**

A descriptive survey design was used for the study. The study was carried out in secondary schools in the six education zones in Anambra state of Nigeria. The sample consisted of 330 science, technology and mathematics (STM) teachers drawn from 55 out of 258 public secondary schools in Anambra state. The population comprised of all STM teachers numbering 1,256 in 258 public secondary schools in Anambra state of Nigeria. Ten (10) public secondary schools were drawn from each of the six education zones in Anambra state through simple random sampling with replacement; However, five public schools were randomly selected from Otuocha zone because they have the smallest number of schools compared to other five education zones. Six STM teachers, one each from Biology, Chemistry, physics, Basic science, Introductory Technology/Technical Drawing and Mathematics were sampled from each of the 55 secondary schools through random selection. By implication, 330 STM teachers (150 males and 180 females) drawn from the 55 public secondary schools in the six education zones in Anambra state participated in the study. The instrument used for data collection was a 30 item structured questionnaire on 4-point Likert type scale (of strongly agree, agree, strongly disagree and disagree) developed by the researcher. The questionnaire was titled: questionnaire on the development of creativity and entrepreneurial skills through STM education.

The questionnaire was validated by two science educators and two experts in Measurement and Evaluation. The instrument was trial-tested on 50 STM teachers drawn from secondary schools that were not involved in the main study. The reliability of the instrument was determined using cronbach Alpha technique. A reliability index of 0.75 was obtained. The researcher considers this a good reliability characteristics. The instrument was therefore adequate and reliable for the study. The questionnaires were administered to the respondents with the help of two research assistants. The questionnaires were retrieved on the spot thereby ensuring 100% return. The research questions were answered using mean and standard deviation. A mean of 2.50 and above indicated that the respondents agreed with the items on the questionnaire while a mean of 2.49 and below indicated that the respondents disagreed with the item on the questionnaire. The hypotheses were tested using t-test statistics at  $P < 0.05$ .

### **Result**

The results were presented according to research questions in tables 1,2 and 3 while the test for the hypothesis were presented on tables 4 and 5

*Development of Creativity/Entrepreneurial Skills among Science Education Students: Challenges and Prospects - Prof. Benadette Ugochi Chukwunekę; Dr. Eucharia Ndidi Ikvwuanusi and Dr. Sylvester Ugwu Oziokę*

**Table 1: mean rating and standard deviation of the response on preparedness of STM teachers in the development of creativity/ entrepreneurial skills in secondary school students.**

S/ N	QUESTIONNAIRE ITEMS	MALE RESPONDENTS			FEMALE RESPONDENT		
		$\bar{x}$	SD	DECISION	$\bar{x}$	S.D	DECISION
1	Total lack of facilities in school	2.98	0.52	Agree	3.12	0.72	Agree
2	Insufficient time	2.86	0.74	Agree	2.68	0.62	Agree
3	Insufficient information about entrepreneur skills	2.38	0.68	Disagree	2.12	0.72	Disagree
4	Poor remuneration	2.94	0.73	Agree	2.88	0.82	Agree
5	Lack of science teacher's imprest account	2.42	0.58	Disagree	2.11	0.66	Disagree
6	Voluminous curriculum	2.72	0.78	Agree	2.92	0.66	Agree
7	Poor classroom condition	2.06	0.66	Disagree	2.08	0.68	Disagree
8	Increased workload due to additional content in the existing curricula	1.06	0.63	Disagree	1.54	0.44	Disagree
9	Lack of sponsorship to conferences/workshops	2.72	0.78	Agree	2.92	0.66	Agree
10	Lack of in-service training for science teachers	3.88	0.92	Agree	3.86	0.86	Agree
11	Laziness and poor attitude to work	2.42	0.58	Disagree	2.11	0.66	Disagree
12	Poor funding of education by govt.	2.94	0.73	Agree	2.88	0.82	Disagree
	Total. $\bar{x}$ /SD	2.69	0.69	Agree	2.60	0.69	Agree.

From table 1: item. 1,2,4,6,9,10 and 12 have mean rating above the cut. Off point of 2.50 for both male and female respondents respectively. Thus the respondents were perceived to agree with the statements/ items on the questionnaire. How-ever items 3,5,7,8, and 11 have mean rating below cut-off point of 2.50 for both males and female respondents respectively. Thus the respondents were perceived to disagree with the statements/items on the questionnaire with average mean ( $\bar{x}$ ) score of 2.69 and 2.60 for both males and female respondents respectively. In other word, they were not prepared in the development of creativity/entrepreneurial skills in secondary school students because of unavailability of the following factors above.

**Table 2: mean rating and Standard Deviation of the responses to the challenges to the acquisition of creativity/ entrepreneurial skills by secondary school students.**

S/ N	QUESTIONNAIRE ITEMS	MALE RESPONDENTS			FEMALE RESPONDENT		
		$\bar{x}$	SD	DECISION	$\bar{x}$	S.D	DECISION
13	Inadequate Infrastructures for experiment and practicals	3.48	0.62	Agreed	2.62	0.58	Agreed
14	Teaching of entrepreneurial skills is not included in secondary school STM curriculum	3.06	0.81	Agreed	2.81	0.73	Agreed
15	Poor funding of education by government	2.78	0.83	Agreed	2.88	0.63	Agreed
16	Students lack of interest in practical activities and entrepreneurial skills	2.84	0.86	Agreed	2.78	0.63	Agreed
17	Poorly equipped laboratories and workshops for practical work	3.88	0.92	Agreed	3.86	0.86	Agreed
18	Time and money consuming	3.02	0.89	Agreed	2.98	0.81	Agreed
19	Inadequate number of qualified STM teachers to teach entrepreneurial skills	3.08	0.89	Agreed	3.00	0.88	Agreed
20	Unavailability of equipment/ materials needed teaching entrepreneurial skills	2.78	0.83	Agreed	2.62	0.63	Agreed
21	Poor motivation of STM teachers	3.33	0.72	Agreed	3.68	0.84	Agreed
22	Voluminous curriculum	2.78	0.83	Agreed	2.58	0.63	Agreed
	Total $\bar{x}$ /SD	3.10	0.82		2.98	0.73	

From table 2, the average mean rating of items 13-22 for both males and female respondents were 3.10 and 3.19 respectively which is above the cut-off point of 2.50, thus respondents agreed with the statements/ questionnaire items as the challenges to

*Development of Creativity/Entrepreneurial Skills among Science Education Students: Challenges and Prospects - Prof. Benadette Ugochi Chukwunekę; Dr. Eucharia Nđđđ Ikwuamusi and Dr. Sylvester Ugwu Oziokę*

the acquisition of creativity/ entrepreneurial skills by secondary school students in Anambra state Nigeria.

**Table 3: means rating and standard deviation of responses relating to prospects for the development of creativity/ entrepreneurial skills in students.**

S/ N	QUESTIONNAIRE ITEMS	MALE RESPONDENTS			FEMALE RESPONDENT		
		$\bar{x}$	SD	DECISIO N	$\bar{x}$	S.D	DECISIO N
2 3	Provision of adequate infrastructure for experiment.	2.6 8	0.7 2	Agreed	2.5 4	0.5 2	Agreed
2 4	Teaching of entrepreneurial skills should be included in secondary school STM Curriculum	3.0 0	0.8 3	Agreed	2.9 8	0.8 1	Agreed
2 5	Education should be properly funded by government	3.2 8	0.8 1	Agreed	3.1 2	0.6 9	Agreed
2 6	Laboratories and workshops should be properly equipped	3.2 6	0.8 8	Agreed	3.1 8	0.9 2	Agreed
2 7	Promote school-industry link so that industries can provide support staff for teaching entrepreneurial skills	2.9 8	0.8 3	Agreed	3.1 1	0.7 1	Agreed
2 8	Provide in-service training for serving STM teachers to up-date their knowledge and skills in entrepreneurial skills	3.1 8	0.8 6	Agreed	3.0 3	0.8 1	Agreed
2 9	Provide sufficient fund for the purchase of material resources needed for the teaching and learning of entrepreneurial skills	2.8 3	0.7 4	Agreed	3.3 1	0.8 9	Agreed
3 0	Motivate STM teachers adequately through enhanced salaries, allowances and other incentives.	2.6 2	0.7 2	Agreed	2.5 2	0.5 1	Agreed
	Total	2.9 7	0.7 9		2.9 7	0.7 3	

From table above, total mean rating for items 23-30 for both male and female respondents was 2.97 which is above the cut-off point of 2.50. Thus the questionnaire items were accepted by the respondents as prospects for the development of creativity/entrepreneurial skills in secondary students in Anambra state Nigeria.



**Table 4: t-test on the mean responses of male and female STM teachers on preparedness to develop entrepreneurial skills through STM education in secondary school students.**

GROUP	N	$\bar{x}$	SD	DF	t-CAL	LEV OF SIG.	t-CRIT.	DECISION
Male respondents	150	2.69	0.69	328	0.69	0.05	1.96	H <sub>0</sub> ACCEPTED
Female respondents	180	2.60	0.69					

From table 4 above, t-calculated is 0.69 while the t-critical is 1.96. Therefore the null hypothesis of no significant difference on the responses of male and female STM teachers on preparedness on the development of entrepreneurial skills through STM education in secondary school students is accepted.

**Table 5: t-test on the mean responses of male and female STM teachers on the challenges to the acquisition of entrepreneurial skills by secondary school students.**

Source of variation	N	$\bar{x}$	SD	DF	t-CAL	t-CRIT.	LEV OF SIG.	DECISION
Male Respondents	150	3.10	0.82	328	1.40	1.96	0.05	H <sub>0</sub> ACCEPTED
Female Respondents	180	2.98	0.73					

Table 5, above shows that t-calculated is 1.40 while t-critical is 1.96. as a rule, since the t-calculated is less than the t-critical, the null hypothesis is accepted. This implies that there is no statistical significance difference between the male and female responses on the challenges to the acquisition of creativity/entrepreneurial skills by secondary school students through STM education.

**Discussion:**

The findings of this study showed that STM teachers agreed that they were not prepared on the development of creativity/ entrepreneurial skills in secondary schools because of the following factors: Total lack of facilities in schools, insufficient time to do practicals, poor remuneration, voluminous curriculum, lack of sponsorship to conferences/workshops, lack of in service training and poor funding of education by the government. This findings are in agreement with the findings Akpan, (2008) that the current science and technology education programme need to be redesigned to emphasize skill acquisition, (especially entrepreneurial skills) which equip its recipients with appropriate life skills for self-employment and self reliance. Thus the findings of this study showed that STM teachers were not prepared to develop entrepreneurial skills in Nigerian students but are willing to do so when they are properly trained and necessary facilities provided. This is probably because many of the serving STM teachers were not exposed to entrepreneurial education in their various institutions of higher learning which they attended. The study also identified some challenges to the acquisition of creativity/ entrepreneurial skills by secondary school students as follows:

*Development of Creativity/Entrepreneurial Skills among Science Education Students: Challenges and Prospects - Prof. Benadette Ugochi Chukwunekę; Dr. Eucharia Ndidi Ikwuanusu and Dr. Sylvester Ugwu Oziokę*

---

Inadequate infrastructures for practicals, teaching entrepreneurial skills not included in the STM curriculum, students lack of interest in practicals, inadequate number of qualified STM teachers to teach entrepreneurial skills, poor motivation of STM teachers, voluminous curriculum, time and money constraints. (Onwuakpa and Akpan 1999 Osebonye, 2002, and Aderounmi, 2006) highlighted inadequacy of material resources to carry out experiments and practical work and few available ones in very poor state of maintenance that it cannot be used. Sometimes, the science and technology equipment is absolute and unfit for training students for the labour market in this present scientific and technological age. Thus, most STM teacher, teach the theoretical aspect of the curriculum and neglect the practical aspect.

Again, the study showed that there is prospects in the development of entrepreneurial skills in secondary schools if the following strategies are applied: provision of adequate infrastructure for experiment, inclusion of entrepreneurial skill education in STM curriculum, proper funding of education by government, promotion of school- industry link, industries to provide support staff for teaching entrepreneurial skill.

**Conclusion:**

It is an obvious fact that creativity/entrepreneurial education in secondary school is a must if the society is to rise above poverty and joblessness. All hands must be on deck, both teachers, government, parents to ensure that our students are equipped with appropriate skills before graduation from secondary school for self-employment and self-reliance to curb the menace of unemployment and crime in the society.

**Recommendations:**

The following recommendations were made, based on the findings of the study:

- Off-load the curriculum to include entrepreneurial skills acquisition which seems to be lacking.
- Organizing in-service training for science and technology teachers on regular basis.
- Sponsoring STM teachers to conferences and workshops annually to update their knowledge.
- School-industry link should be promoted so that industries can provide support staff for teaching entrepreneurial skills.

**References**

- Aderoumi, A.O (2006). Status of Human and Material Resources for Nigerian Science and Technical collages: Issues and Challenges for STM education47<sup>th</sup> Annual proceedings of STAN. Nzewi, U.M (ed) 8-13

- Akpan, B.B (2008). Nigeria and the Future of science Education. Ibadan: Science Teachers Association of Nigeria.
- Aksoy, G (2005). Creat a bottom Science Education: Scientific Method, process- based learning products, the effect of UNMEE. Zonguldak Karaelmas University (Master's Thesis).
- Amesi,J (2011). Critical characteristics and qualities Needed for successful entrepreneurship in the Niger. Delta. Unpublished ph.D Dissertation. UNIZIK, Awka.
- Amesi, J & Akpomi, M.E (2018). Entrepreneurs success and creativity in Business Education. Journal of Education and practice 5(2) 40-47.
- Chukwunke, B.U (2009) creativity through STM Education: A Gateway to the Development of Entrepreneurial Skills Among Nigeria Nigerian Graduates. STAN 50<sup>th</sup> Annual Conference proceedings. 357-361.
- Cheng M.Y.V (2011). Infusing creativity into Eastern classroom: Evaluation from student's perspectives. Journal of Thinking skills and creativity. 6,67-87.
- Curriculum Development council (2002). Science Education: key Learning area curriculum Guide (primary 1-secondary 3). Hong Kong: curriculum Development Council.
- David, F (2008). Global Entrepreneurship: Opening up new Opportunities for people across the country and the world. Journal of Business Venturing. 4, 212-22.
- Franken, R.E (2007). Human Motivation. 3<sup>rd</sup> edition. www. csum. Edu.
- Gilbert,S.W (1992). Systematic Questioning: Taxonomies that Develop Critical Thinking skills. Science Tech: 59(9) 41-46.
- Naiman, L (2007). Creativity at work www. Creativity at work.com
- Okoli,J.N and Onwuachu, W.C (2009). Preparedness of STM Teachers to develop Entrepreneurial skills in secondary school students through STM Education. STAN 50<sup>th</sup> conference proceeding, 38-46.

***Development of Creativity/Entrepreneurial Skills among Science Education Students:  
Challenges and Prospects - Prof. Benadette Ugochi Chukwuneke; Dr.Eucharia Ndidì  
Ikwanusi and Dr. Sylvester Ugwu Ozioko***

---

- Okoye, K.R & Eze, T.I (2010). Promoting creativity and Entrepreneurship in Education: The Panacea for poverty reduction in Nigeria. African Research Review. 4(39) 119-133.
- Oludare, O.T and Abiodun, O.S (2007). The State of learning Resources in secondary Science, Technology and mathematics (STM) Education for sustainable Development in Lagos State. Proceedings of 50<sup>th</sup> Anniversary conference of STAN, NZEWI, U, M (ed) 68-72.
- Onu, A.D (2007). Creativity as a tool for Enhancing Effective Teaching and Learning of Science and Mathematics. Journal of quality Education. 3(2)101-108.
- Osobonye, G.T (2002). Nigerian Secondary School Laboratories and Goal of Science Education. 43<sup>rd</sup> Annual conference proceedings of STAN, Akale, M.A (ed) 160-164.
- Osuala, E.C (2004). Principles and Methods of Business and computer Education. Enugu, Nigeria: Cheston Agency LTD.