



PERSPECTIVES OF BIOLOGY IN ENTREPRENEURIAL EDUCATION FOR SUSTAINABLE DEVELOPMENT IN RIVERS STATE

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ABSTRACT: The research examined biology perspective to entrepreneurial education for sustainable development in Rivers State. The study employed a descriptive survey with three research questions which guided its conduct. Questionnaire was the instrument used to capture data and all the twenty five (25) biology teachers in nineteen (19) senior Secondary schools in Gokana and Eleme Local Government Areas of Rivers State were used as sample size. The data collected were analyzed using mean and standard deviation at 2.50 criterion value. The statistical results obtained reveals that the application of discovery, inquiry, demonstration and project techniques can effectively enhanced the transmission of entrepreneurial skills in senior secondary schools. Also, the research identified the non-inclusion of entrepreneurship education on the school time table, the apathy biology teachers displayed toward entrepreneurial practice and the inability of biology teachers to transmit entrepreneurial skills due to lack of competence considered to be the major challenges biology teachers faced in transmitting entrepreneurial skills to secondary school students. And to solve these problems, the study identified the need to re-design biology curriculum and the need to train biology teachers to acquire requisite skills. The research also postulated that a learner should be able to showcase a micro-bio entrepreneurial venture before graduating from secondary schools.

INTRODUCTION

Biology is a natural science career like physics and chemistry which because of their affinity are studied interrelatedly as in Biophysics and Biochemistry. The term biology is derived from two Greek words "Bios" meaning "life" and logy which means "study". Therefore, biology is defined as the science which study life in living organisms. Living organisms are the various diversity of plants and animals that occupy all known habitats in the universe. In nature living organisms interact to form more complex levels of biological organization. All the members of similar species that inhabit the same geographical

area at the same time constitute a population. The population of different organisms interacting with each other forms a community. And a community of organisms interacting with one another and the non-living components of the environment make up the ecosystem. Also, an ecological system is a natural unit consisting of the biotic and the abiotic components of the environment. The flow of energy originating from the sun is the driving force of an ecosystem. All the earths' ecosystems constitute the biosphere. The biosphere is an area where living organisms inhabit.

Major ecological systems are marked with differences in life conditions. Natural selection has produced a bewildering array of organic forms and adaptations. But there are common properties that are shared by these diverse ecosystems. An order of diversity emerges when considering a particular level of biological function in a particular level of organization. All the ecosystems perform the same function subject to the same ecological laws regardless of their physical and structural differences. This fundamental function is the production of food and the transfer of energy from one set of organism to the other. Also, the organic matter produced must be decomposed and essential elements are then released and recycled through the system. The laws that apply to energy flow and biogeochemical cycles in a desert are also applicable to the water/ocean environment. Therefore, the construction of a particular ecosystem is nature's response to special set of limiting conditions found in that environment. The physical properties of an ocean set definite limit but they also provide opportunities for organisms in the sea. The availability of water, temperature, light, oxygen and other chemical elements required for life sustenance of an environment are the ground rules within which an ecosystem evolves to carry out its essential functions. When man recognized these ecological principles, he becomes better equipped to use the ecosystem in ways to supply his needs without destroying it. This is the basis of environmental sustainability.

Nature endowed the earth ecosystem with enormous resources derived from plants and animals. The plants are the living factories for the production of food. This is because they contain chlorophyll which is the only pigment known to trap the sun energy. And through photosynthetic process convert the sun energy into chemical energy in the form of food. Green plants supply food to the entire world population. It is estimated that food derived from plant origin account for 70% world protein supply (Abbot, 1986). The numerous micro and macro plants and animal products which biologists seek to harness in the course of studies is capable of building a veritable sustainable life of the people of Nigeria in general and Rivers State in particular. It is therefore very necessary for the undergraduate and graduate students of biology to exploit these plant and animal resources to improve the living standard of the society. This feat is possible through bio-entrepreneurial practice.

Statement of Problem

The study seeks to appraise biology perspectives to entrepreneurship education for sustainable development in Rivers State. The investigation has great impetus on the fact that biology graduates from secondary and tertiary institutions are daily in geometric increase. Yet, there is no corresponding job opportunities either created by the Federal, State or Local Governments or by public/private organizations that can adequately absorbed these growing number of unemployed youths in the society. Although, these youths have been trained in various colleges and universities, but lack requisite skills and knowledge to explore the environment for a sustainable living. Hence, they are faced with gross consequences of untold hardship, hunger, abject poverty, depravity, sexual abuses (for female counterparts). Most often too, parents including other close relatives challenged them with questions like: why did you go to school? Can't you find something to do? We have trained you, when will you help to train others. These and many more are the teething challenges of unemployed youths generally and biologists in particular. Then, some of the youths who cannot cope with these

trauma, ventured into armed robbery, kidnapping, cultism, drugs trafficking, prostitution and other anti-social vices in order to survive.

Interestingly, biology as a science deals with the study of living organisms in nature. And, nature has endowed the earth with diversity of biotic resources (plants and animals). All the foods of man globally are derivatives of biological sources namely: the plants and animals (being the Pivot of biological practice). The greatness and importance of a state or nation is when her people maximally harnessed and utilize the abundance plant and animal resources for sustainable growth and development. Therefore, it is of immense necessity to utilize the knowledge and skills acquired through formal education training to exploit these natural resources to improve the standard of living of the citizenry. However, due to seeming lacuna created in the foregone prompted this study.

Purpose of the Research

The purpose of the research is to investigate the perspective of biology to entrepreneurial education for sustainable development in Rivers State. The objectives of the study therefore are:

1. To examine if the method of teaching biology enhance the transmission of entrepreneurial skills?
2. To examine how the problems teachers encountered hinder the transmission of entrepreneurial skills?
3. To examine the possibilities of overcoming these problems.

Research Questions

The following three questions guide the conduct of this research:

1. What method of teaching biology can enhance the transmission of entrepreneurial skills?
2. What problems do biology teachers faced in transmitting entrepreneurial skills?
3. What are the remedies to the problems of transmitting entrepreneurial skills?

Significance of the Study

The natural biomes of Rivers State comprised the mangrove, swamps, forest, arable land and the aquatic environment. These ecosystems are endowed with numerous plant and animal resources. The maximum exploitation and utilization of these natural resources will enhance sustainable development of Rivers State. Then the practitioners in the various fields of biology like zoologists, Botanist, parasitologist, cytologist, laboratory scientist, microbiologist, Biochemist, Biophysicists, Geneticists and its allied are responsible to tap these resources of nature to make wealth through job creation. The essence of this investigation is to evolve mechanisms that will enhance the realization of the aforesaid objectives. In addition, the study will serve as a prototype to motivate students/graduates in the field to discover job creative skills. It will also provide insight to researchers in any fields of biological science.

Scope of the Study

The research took into consideration all the biology teachers in public senior secondary schools in Gokana and Eleme Local Government Areas.

Research Design

A descriptive survey is adopted for the research. The research evaluates biology perspectives to entrepreneurship education for sustainable development in Rivers State.

Population

The study considered all biology teachers in public senior secondary schools in Rivers State. However the target population include biology teachers in public senior secondary schools in Gokana and Eleme Local Government Areas.

Sample and Sampling Techniques

The survey captured all the twenty-five biology teachers in all the nineteen public senior secondary schools in the two Local Government Areas of Rivers State. A cluster sampling techniques was used in the selection of the two Local Government Areas.

Instrument for Data Collection

The study used questionnaires to collect data. A twenty-seven (27) structured questions on a four likert scale was administered to generate information from respondents.

Validation of the Instrument

The twenty-seven structured questions were framed carefully. The questions captured all the measurable items. The prototype of the questions were sent to three experts for correction and moderation. The responses obtained forms an integral part of this investigation.

Administration of Instrument

The questionnaires were administered by direct delivery. The recipients responded accordingly.

Questionnaire

Kindly tick the most appropriate option to each question

(Strongly Agree - SA, Agree - A, Strongly Disagree - SD, Disagree - D)

Q.1	What method of teaching Biology can enhance the transmission of Entrepreneurial Skills?	SA	A	SD	D
1	Discussion method of teaching can enhance the transmission of entrepreneurial skills?				
2	Discovery method of teaching can enhance the transmission of entrepreneurial skills				
3	The application of inquiry technique is best to enhance the transmission of entrepreneurial skill				
4	The use of demonstration method can help to transmit entrepreneurial skills				
5	Team work approach can elicit entrepreneurial skills				

	transmission				
6	Transmission of entrepreneurial skills can be effective through project technique				
7	The combination of theory with practice can effectively enhance entrepreneurial skill transmission				
Table 1.2					
Q.2	What problems do biology teachers faced to transmit entrepreneurial skills?				
8	Entrepreneurship education is not included in the school time table				
9	The time table captured two or more periods of entrepreneurship education weekly.				
10	Biology teachers can effectively teach entrepreneurship in secondary school.				
11	The school curriculum emphasized the transmission and acquisition of entrepreneurial skills.				
12	Biology teachers possess the competence to transmit requisite entrepreneurial skills.				
13	The Government placed value on entrepreneurship skills acquisition than certificates.				
14	The learning experiences in the curriculum can motivate the teaching and learning of Bio-entrepreneurship.				
15	Biology teachers show apathy to entrepreneurial practice.				
16	Students are usually happy to return to farming after graduation from universities.				
17	The teachers cannot transmit entrepreneurial skills because they lack the competence.				
18	Biology teachers were trained to acquire entrepreneurial skills from tertiary institutions				
19	The authority provides enough space in the school for micro-entrepreneurial practice				
20	While in school students are encouraged to learn by discovery/insight approach.				
Table 1.3					
Q.3	What are the remedies to the problems of transmitting entrepreneurial skills?				
21	There is a need to re-design the curriculum to inculcate the acquisition of entrepreneurial skills				
22	The teachers of biology should be train to acquire				

	entrepreneurial skills while in school				
23	The learner should be encourage to learn through insight/discovery technique in school.				
24	Government should give scholarship to students with vested interest in entrepreneurship education.				
25	A learner should showcase a micro-entrepreneurial outfit before graduation.				
26	The Government should provides grants, loan and other incentives to young bio-entrepreneurs.				
27	The Government should implement bio-entrepreneurship as a course of study in schools.				

METHOD OF DATA ANALYSIS

Statistically the data collected were analyzed using mean and standard deviation.

Research question 1: What method of teaching biology can enhance the transmission of entrepreneurial skills.

Table 2.1: Mean and standard deviation showing methods that can enhance the transmission of entrepreneurial skills

S/no	Item	Mean	Std.dev	Decision
1	Discussion method of teaching can enhance the transmission of entrepreneurial skills	2.12	1.12	Not agreed
2	Discovery method of teaching can enhance the transmission of entrepreneurial skills	2.84	0.89	Agreed
3	The application of inquiry technique is best to enhance the transmission of entrepreneurial skills	2.60	1.11	Agreed
4	The use of demonstration method can help to transmit entrepreneurial skills	2.80	0.95	Agreed
5	Team work approach can elicit entrepreneurial skills transmission	2.76	0.92	Agreed
6	Transmission of entrepreneurial skills can be effective through project technique	2.76	1.09	Agreed
7	The combination of theory with practices can effectively enhance entrepreneurial skills transmission	3.20	0.76	Agreed

Table 2.1 present results on the methods that can enhance the transmission of entrepreneurial skills. All the items have a mean greater than the criterion mean of 2.50 apart from item 1. This is an indication that all the methods of teaching biology listed in the above table can enhance the transmission of entrepreneurial skills apart from the method in item 1.

Research question 2: What problems do biology teachers face in transmitting entrepreneurial skills?

Table 2.2: Mean and standard deviation showing the challenges faced by biology teachers in transmitting entrepreneurial skills

S/no	Item	Mean	Std.dev	Decision
8	Entrepreneurship education is not included in the school time table	2.60	1.04	Agreed
9	The time table capture two or more periods of entrepreneurial education weekly	1.80	0.76	Not Agreed
10	Teachers can effectively teach entrepreneurship in secondary school	1.60	0.50	Not Agreed
11	Emphasized the transmission and curriculum acquisition of entrepreneurial skills	1.60	0.81	Not Agreed
12	Biology teachers possess the competence to transmit requisite entrepreneurial skills	2.00	0.64	Not Agreed
13	The government placed value on entrepreneurial skills acquisition than certificates	1.60	0.81	Not Agreed
14	The learning of experience in the curriculum can motivate the teaching and learning of Bio- entrepreneurship	1.80	0.40	Not Agreed
15	Biology teachers show apathy to entrepreneurial practice	3.40	0.81	Agreed
16	Students are usually happy to return to farming after graduation from universities	1.80	0.76	Not Agreed
17	The teachers cannot transmit	3.30	0.75	Agreed

	entrepreneurial skills because they lack the competence			
18	Biology teachers were trained to acquire entrepreneurial skills from tertiary institutions	1.40	0.50	Not Agreed
19	The authority provides enough space in the school for micro- entrepreneurial practice	2.00	0.64	Not Agreed
20	While in school students are encouraged to learn by discovery/insight approach.	2.20	1.12	Not Agreed

Table 2.2 present results on the problems biology teachers face in transmitting entrepreneurial skills. The result reveal that respondents agreed to items 8, 15 and 17 as problems faced by biology teachers in transmitting entrepreneurial skills. While other items were disagreed as possible challenges faced by biology teachers in transmitting entrepreneurial skills.

Research question 3: What are the remedies to the problems of transmitting entrepreneurial skills?

Table 2.3: Mean and standard deviation showing remedies to the problems of transmitting entrepreneurial skills

S/no	Item	Mean	Std.dev	Decision
21	There is a need to re-design the curriculum to inculcate the acquisition of entrepreneurial skills	3.43	0.49	Agreed
22	The teachers of biology should be train to acquire entrepreneurial skills while in school	3.60	0.81	Agreed
23	The learner should be encouraged to learn through insight/discovery technique in school	3.40	0.50	Agreed
24	Government should give scholarship to students with vested interest in entrepreneurial education	3.74	0.74	Agreed
25	A learner should showcase a micro entrepreneurial outfit before graduation	3.20	1.19	Agreed
26	The government should provide grants, loan and other incentives to young bio- entrepreneurs	3.00	0.64	Agreed
27	The government should implement bio- entrepreneurship as a course of study in school	2.60	1.04	Agreed

Table 2.3: Above shows the remedies to the problems of transmitting entrepreneurial skills. All the items have a mean score greater than the criterion mean of 2.50. This confirmed that all the items listed in the table are possible remedies to the problems of transmitting entrepreneurial skills in senior secondary schools.

DISCUSSIONS

As shown in table 2.1 above, the research identified six potent techniques that can effectively enhanced the transmission of entrepreneurial skills in senior secondary schools. They include; discovery, inquiry, demonstration, team work, project and a systematic combination of both theory and practice in the teaching and learning process. Cirfat and Zumyil (2000) have earlier submitted that discovering and inquiry are two indispensable techniques that elicit the transmission and acquisition of entrepreneurial skills in secondary school education system. Similarly, Anold (1975) have postulated that, demonstration, team work, and project methods are important and effective in enabling the learner to acquire requisite skills in schools. The classical postulate of champagne (1987) strongly supported the preposition of this research that effective application of theory and practice in the teaching and learning process of biology in secondary schools yield unparalleled results in building the students in skills acquisition. Again, the mean and standard deviation result in table 2.2 revealed that, the non-inclusion of entrepreneurship education in the secondary schools time table, the apathy biology teachers displayed towards entrepreneurial endeavour and the inability of biology teachers to impart entrepreneurial skills due to the lack of competence are the basic challenges biology teachers faced in transmitting entrepreneurial skills to students in senior secondary schools.

The submission of willardl (1993) gave credence to the fact that, biology teachers apathy towards entrepreneurship education served as a hindrance in the transmission and acquisition of entrepreneurial skills. Slumpf (1992) have earlier advocated that, secondary school

time table does not captured entrepreneurship education as a subject to be studied in secondary schools. Also, the inability of biology teachers to transmit entrepreneurial skills to biology students in secondary school due to the lack of competence is in agreement to the proposition of champagne et al (1984). Moreso, the research identified seven notable panacea to the problems of transmitting entrepreneurial skills to biology students in senior secondary schools in Rivers State as evidently illustrated in table 2.3. These measures are: The need to redesign biology curriculum to inculcate entrepreneurial skills acquisition and the need to train biology teachers to acquire entrepreneurial skills while in school. Others are, to encourage biology students to learn through discovery or insight technique, Government to give scholarship to students with vested interest in entrepreneurship education, a learner to showcase micro entrepreneurial venture before graduating from secondary school, government to provide loans, grants and other incentives to biology students in order to boast bio-entrepreneurial participation.

Finally, the study identified Government implementation of bio-entrepreneurship as a subject to be studied in senior secondary schools. Accordingly, the assertion of Bybee (1994) strongly supported a re-designing of biology curriculum framework used in driven the teaching and learning process in secondary schools. The training of biology teachers to acquire necessary entrepreneurial competence while undergoing secondary school education also gained the impetus of Bybee (1994). Similarly, Douglas (2008), supported the views of the study which emphasized learner's encouragement to learn through insight or discovery method and that the learner should be able to showcase a micro-bio entrepreneurial venture before graduating from secondary schools. In addition, the assertions of Aldrich, (2001) strongly supported that Government should provide scholarships, grants, loans and other essential incentives to young bio-entrepreneurs to serve as a precursor for motivation. The study identified the implementation of bio-entrepreneurship as a course of study in secondary schools. This

view is in consonance with the classic analytic proposal of Aina (2006).

In an explicit term, entrepreneurship is the dynamic process of creating incremental wealth (Peng 2001). The driven machinery of entrepreneurship is an entrepreneur. This is a person with very high aptitude who pioneers change and possesses peculiar attributes found in few members of the society. Whereas, the Economists see an entrepreneur as a Person that brings resources, Labour, materials and other asserts to meaningful combination Which makes their value greater than before, McGraw and Macmillan (1992). The biologists on the other extreme view entrepreneur as an individual that harnessed and maximally utilized the resources of plant and animal to improve the welfare of man in the society (Lezor 2019). The most fundamental role of an entrepreneur is to revolutionize the pattern of production by exploiting an invention or an untried technology. It could also be to refine an old one in a new way (Lee 2000).

The concept of innovation and newness is an integral part of entrepreneurship. Although, innovation which is the act of introducing something new is one of the most challenging tasks for the enterprise. It takes a person with the ability to create, conceptualize and understand all the variable forces in the environment to the ideal beacon in bio-entrepreneurial endeavours. National competitive advantage is increasingly dependent on the skills based of the work force and on the ability of the firms and individuals (bio-entrepreneurs) to engage in innovations and new economic activity. It is on the basis of this achievement that the research explores the following bio-entrepreneurial careers to create incremental wealth for the citizenry. The careers include: cultivation and exploit of mushrooms most especially the edible species tremalla (tremallafulciformis). French mushroom (Agaricus). Very recently, the red mushrooms has been discovered and proven as therapeutics to cure diverse chronic diseases and ailments like HIV, cancer and diabetics. The practice of heliculture (snail), fish and poultry

farmings. The cultivation of lichens- indicators to detect atmospheric pollution. Using a lichen species called *Rhizocarpon geographicum* to estimate the dates of geographical events such as earthquake and landslides. In addition, bio-entrepreneurs can establish textile industry using biological materials (algin from seaweeds, furamic acid from fungi, lactic acid, xanthan- a polyionichydropolysaccharide).

Bioentrepreneurs to establish a cottage photographic industry where bones, and hooves from animals are used cellulose acetate- a modified plant cellulose are used to make photographic paper. Also, galin acid from fungi and synthesized pyrogallol are used as developers of photographic papers.

Protease enzymes removes gelatin from photographic film. Also, bio-entrepreneurs can create incremental wealth by practicing aromatherapics where extracts from flowers, trees, herbs spices and fruits are used to treat variety of chronic diseases. Furthermore, the bio-entrepreneurial opportunities stipulated above can effectively galvanize sustainable growth and development of Rivers State. Sustainable developments has evolves a synthesis between economic development and environmental preservations. It considers competing objectives like the problems of reconciling social and ecological goals (Dovers, 1992). It also involves strategies to define and monitor some forms of sustainable limits. Notably if natural resources are finite then there must be limit to the carrying capacity of the earths as a matter of preserving the freedom and resources for posterity. The United Nations Brundland commission Report of 1987 defined sustainable development as the development that meet the needs of the present without compromising the ability of future generation to meet their needs. Sustainable development is a social construct and is conditioned by human purpose. The whole concept of development is "value driven" and it is impossible to determine the resources human require without some subjective judgment. And any attempt to proactively pursue it will considerably change human needs, motives and aspirations. The resultant effects of the study can

effectively harness plant and animal resources and also engage in the preservation and conservation of the environment.

Therefore, it is necessary to define education which is more expanded than schooling. According to Abie (2019), education is a deliberate and conscious effort any society makes in awakening the latent potentialities of the individual to be aware and participate fully in the accumulated knowledge, skills and attitudes and to cause them to utilize these acquired values to cope with personal problems for effective positive transformation and renewal of the society. The subject teacher transmits the body of knowledge as coded in the school curriculum to the learners. Obviously, any curriculum that is devoid of practical effectiveness and inherent productivity of the learner is defective. It must inculcate an explanation and a justification of the purpose of such transmission and an exploration of the effects that exposure of such knowledge is intended to have on the recipient. In this sense, curriculum is a comprehensive plan for an educational/training programme to offer new/improve manpower to fulfill the missing needs of a dynamic society (Abie, 2019). Hence, the school curriculum content exposes the learner to do, feel and know respectively. These three elements formed the basis of a formidable curriculum. And since the school curriculum of biology is deficient of this essential ingredient, the research advocates its re-designing.

In a swift attempt to motivate bio-entrepreneur, this research then proposed an action learning technique which considers the learner to be the catalyst in the process. To make it effective, the curriculum should stipulate the requisite skills that a learner must acquire in the course of training. The teacher while transmitting instructions to the learner to understand the concepts and principles should serve as a facilitator. In this activity-oriented task, the teacher needs to display minimum intervention but should provide ample opportunity for the learner to discover or innovate yet new or closely related platform. Although, the teacher monitors the students but must limit

authoritative instructors. The teacher should rather present questions that will spur the learner to identify critical issues necessary to make the task continue with intention to achieve desirable objectives. This principle is a reflection of insight learning. Then the classical insight learning theory of Wolfgang Korler (1925) support the preposition of the research.

CONCLUSION

The study x-ray biology perspectives to entrepreneurial education for sustainable development in Rivers State. The investigation considers biology as a natural science subject which studies life in the natural endowment (plants and animals) of the earth. The study further unraveled that the maximum harnessing and utilization of these natural resources is capable to propel Rivers State on a faster level of suitable growth and development. The study identified varying careers of bio-entrepreneurship education. Again, it underscores the school curriculum as an indispensable tool to drive bio-entrepreneurship education curriculum as prime endeavour in achieving the objectives of bio-entrepreneurs in Nigeria generally and Rivers State in particular. Finally, the study proposed an action learning technique where the learner is the catalyst to drive the process to a logical conclusion.

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