

STRATEGIES OF IMPROVEMENT FOR THE PERCEIVED DIFFICULT AREAS IN THE TEACHING AND STUDY OF BIOLOGY IN AGUATA LGA, ANAMBRA STATE

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Abstract

The study focuses on the Identification of Senior Secondary School Biology Content Areas Perceived to be Difficult by Teachers and Strategies for Improvement in Aguata Local Government Area of Anambra State. It examined the difficult Concepts in Nigeria Senior Secondary School (SSS) Biology Curriculum as identified by the teachers and suggested Strategies for Improvement. The study adopted a descriptive survey design which sought the Identification of Senior Secondary School Biology Content Areas Perceived to be Difficult by Teachers and Strategies for Improvement in Aguata Local Government Area of Anambra State. The population of the study is thirty-six (36) Biology teachers in twenty-one (21) Government secondary schools in Aguata Local Government Area, Anambra State. There was no sampling; the entire population was used because the population was small. The instrument used in collecting data was a structured questionnaire which was distributed to the population by the researcher and 3 research assistants. The researcher analyzed the data using mean and standard deviation and the hypothesis was tested statistically using t-test at 0.05 level of significance. The result of the data analysis revealed among others that the teachers identified the following concept as difficult concepts in senior secondary school biology curriculum; reproductive behaviours, terrestrial habitat, biology of heredity (Genetics), fruit, regulation of internal environment, transport system, nervous co-ordination, development of new organisms, variations in population, evolution. Besides, the teacher identified the following as the factors responsible for the identified difficult concepts unavailable instructional materials, inadequate teachers' education curriculum, complexity of topics among others. The hypothesis was tested using t-test. The findings of the study showed that, there is no significant difference between the mean responses of male and female biology teachers on the content areas teachers identified as difficult to teach in senior secondary schools. Based on the findings, the researcher recommended among others that the teacher education curriculum should be overhauled to include revision of some concepts in the senior secondary school mathematics curriculum. Also, teachers should be sensitized to make a personal effort to develop themselves adequately in their specialized subjects.

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Keywords: Strategy, education, teaching, learning, biology and Aguata LGA

Introduction

Education has a vital role in all fields of life. The education system works around many people and teachers in the world. Teachers are the most powerful forces in education. The knowledge, skills and characteristics of teachers show the quality of the overall education system of nations (Farooq, 2000).

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Nations with a more effective education system can grow and get success around the world. In short, it is an education system that can be a good and effective for the country. In fact, teaching is a tool that transforms human skills and knowledge in new generation which based on where people can contribute for development of their communities and therefore human share resources for further development (Hoodbhoy, 2008).

A teacher is a trained licensed professional who is saddled with the responsibilities of impacting/facilitating knowledge. A facilitator of knowledge should be someone who is well informed about the instruction and the content. This is because it is practically impossible for someone to give others what he/she does not possess. Adegoke (2004) defined a teacher as a properly trained, certificated, registered and licensed professional who has attended a teacher

training institution and completed its prescribed, rigorous, systematic and validated teacher education programs in the art and science of teaching their specialized subject(s) at a particular level of the educational system. A teacher, therefore, is someone who creates and influences desirable changes in the learner's behaviour to achieve the nation's educational goals and aspirations.

Teacher's role in curriculum implementation is very paramount because teachers are the interpreters and implementers of curriculum content. Teacher's knowledge about the content areas of the curriculum and the ability to effectively use the pedagogical skills determines the success of the curriculum implementation process. Students' failure in biology at secondary school level has been attributed to many variables but teachers' variables seem to take the lead among all the variables identified by different scholars. (Ogunleye and Akinoso et al, 2016).

Teacher's role in curriculum implementation according to Fadairo and Olorisade (2002) include; a teacher should be an Innovator: - One of the teacher's roles is to improve the curriculum to meet the needs of the society and that of the learner. He is to update his knowledge and ensures the maintenance of quality and high educational s standard. He is also expected to serve as the coordinator of educational activities as well as project into the future, to improve on the standard of education in the society; the dispenser of knowledge: - A teacher is expected to be conversant with the skills of teaching and making relevant use of teaching materials. The Teacher is expected to have adequate knowledge of the subject(s) and at the same time possess the required pedagogical skills; a teacher is a facilitator of learning: - A teacher should be a resourceful person who has the capability of helping students to learn or gain knowledge. In this role, the teacher adopts a positive disposition toward the learners, the teacher considers the learners' interest, and experiences to influence desirable learning in the learners; and a Counsellor who is a teacher that has the responsibility of advising and helping students to develop their potentials. The teacher assists students in making personal adjustments, solves behaviour problems, advice on placement problems, and guides on occupational selection to guarantee a life of personal fulfilment.

If teachers performed their expected roles adequately, it is important to ask why most students fail to attempt more than half of the questions set for them, from the required curriculum contents especially in external examinations. This is an indication that the process of teaching has been ineffectively handled. For instance, Jimoh (2003) discovered that an appreciable number of chemistry teachers in secondary school found some chemistry content difficult. He stressed further that questions on these teachers' perceived difficult concepts are found frequently in part II of WAEC questions which usually carry more marks than other parts. His findings also revealed that most students also had problems with most of the topics identified as difficult by teachers. While Oyewole (2011) stated that some teachers give the impression that genetics is an abstract and difficult area that requires a lot of brainstorming and need not be studied.

According to Adeleke, (2007) and Oyedokun, (2002), a concept is said to be difficult for the teacher when the questions on the topics cannot be easily handled or solve by the teacher due to the nature or abstractness of the concept and such concept according to them demands extra effort to understand. Hence, it is necessary to know those topics that are identified as difficult topics by the teachers so that, necessary measures can be taken to enhance the teachers' understanding of such topics since students' performance depends greatly on the ability of the teachers to effectively carry out their duty.

The issue of poor performance in Senior Secondary Biology in Nigeria has been a concern to parents, teachers, and many stakeholders in Education. Many efforts have been put in place by the government to improve students' outcomes on the subject but the situation is still not impressive (Adeniyi, 2012 and Akanni 2015). Hence, it is important to know the areas

teachers are finding difficult in the curriculum since success or failure of any educational process depend to a large extent on the teacher's ability to deliver. However, this study therefore, sought to investigate those content areas in senior secondary school (SSS) biology curriculum perceived difficult by teachers and strategies for improvement in Aguata Local Government Area.

The purpose of the study was to find out those concepts identified by teachers as difficult concepts in a senior secondary school Biology curriculum. Specifically, the study sought to:

1. Find out those content areas in the senior secondary school Biology perceived difficult by teachers.
2. Ascertain the causes of the identified difficult Biology concepts in the senior secondary school as perceived by teachers.
3. Find out strategies to be employed in solving the problem of difficult content areas in Senior Secondary Schools Biology as perceived by the teachers.

With the increasing importance of Biology in national development greater emphasis has been placed on effective teaching and learning of Biology at the most crucial preparatory stage of specialist studies in life science. This underscores the need for proper isolation of difficult topics in secondary school Biology to as to address the specific problems encountered by both teachers in the course delivery.

This study will be very significant to both the teachers, students, curriculum developers and the government. The study will isolate those topics the teachers encounter problems in teaching. This will inform the design and implementation of effective retraining program for teachers that will specifically focus on those identified topics. This will invariably strengthen the teachers' competence especially in teaching those topics and this will obviously translate to enhanced performance of the students.

In the same vein the study will isolate the specific topics the students perceive as very difficult to understand. This will inform the teachers on areas of focus and also on the need to employ better pedagogic strategies in handling those topics so as to demystify the topics to the students and consequently improve on their mastery of such topics. This will also translate to improvement in students overall performance in Biology.

The curriculum planners through the findings of this study will be understand areas both teachers and students find difficult. This will guide effective review of the Biology curriculum to ensure that adequate provisions are made through sequencing and resource designs to ensure that such topics are broken down into understandable and comprehensible units. They will also be guided through the finding of this study on the need to ensure that concepts or topics are arranged in such a manner that each builds on the previous learning experience of the students.

The findings of this study will afford the government awareness of the need to ensure that the schools are well funded to acquire the necessary materials and facilities to improved teaching and learning of Biology in the schools. This study will also inform government on the needs to encourage and sponsor in-service training, workshop, seminars and conferences for professional growth and knowledge development of teachers. The findings will guide the government on their design of in-service training and short term workshops for Biology teachers.

Other future researchers would find the study as a good reference material for future studies. They will be guided on the areas that have been covered and further add to literature on content difficulties in sciences.

This study is aimed at identification of senior secondary school Biology content areas perceived to be difficult by teachers and strategies for improvement in Aguata Local Government Area.

Research Questions

The following research questions guided the study:

1. What Biology content areas do teachers identified as difficult in senior secondary schools Biology curriculum?
2. What are the factors responsible for making the identified content areas difficult?
3. What strategies can be employed in solving the problem of difficult content areas in Senior Secondary Schools Biology curriculum as perceived by the teachers?

Research Hypothesis

H₀₁: There is no significant difference in the content areas male and female teachers identify as difficult to teach in Secondary Schools.

Review of Related Concepts and Literature

Here we will review related literature on topics perceived as difficult and teachers' difficulties in Biology especially the literature that has particular significance to this study. The review also attempted to relate similar studies to this one as a way of justifying the present study. The relevant literature related to this work is reviewed under the following sub-heading:

Concept of Biology Education

Biology, according to Hornby (1994) is the science of the life of animals and plants. It also has to do with the studies of the inter-relationships between the living organisms and their immediate environment. In all spheres of human activity, Biology plays a prominent role. It is indispensable in the fields of medicine, agriculture, brewery and petro-chemical industries and even in geology and mining. Because of the indispensability of Biology, much emphasis has been placed on Biology instruction especially at the secondary school level. This is to ensure full realization of the objectives of Biology education as stipulated in the National Policy on Education (F.M.E. 2008). Biology as a science has been providing many important innovations through specialized disciplines such as in genetics, biotechnology, molecular Biology, micro Biology and biochemistry.

Biology is taught both at the secondary and tertiary levels of the Nigerian educational system. The secondary school Biology curriculum was derived from a draft developed by the Comparative Education Study and Adaptation Centre (CESAC), University of Lagos and presented to the National Critique Workshop in December 1984 (FME, 1985). Based on the experiences gathered over the years, a Biology curriculum was proposed for the new (6-3-3-4) system of secondary education and presented to the National Critique Workshop which was further presented to the Joint Consultative committee (JCC) Reference Committee on secondary education in April 1985 for final review and recommendation to the JCC Plenary (FME, 1985). Since then it has undergone a number of reviews and modification to suit the emerging challenges of modern systems and environmental changes.

The focus of the syllabus was derived from the National Policy on Education (F.M.E 2008). The cardinal objectives of the syllabus are to prepare teachers to acquire:

- adequate laboratory and field skills in Biology
- meaningful and relevant knowledge in Biology
- ability to apply scientific knowledge to everyday life in matters of community health and agriculture; and
- reasonable and functional scientific attitudes

The new Biology curriculum is designed to provide new Biology courses while meeting the needs of the society through relevance and functionality in its contents. In terms of structure it

adopted the spiral approach to sequencing thus providing for intellectual maturity as students progresses in their studies. In an effort to ensure continuity and smooth transition from the junior secondary science programme, the content of the junior secondary curriculum was assumed in such a manner that the six themes of the basic science curriculum have references to the themes presented in the new Biology curriculum.

Objectives of Biology Education

The study of Biology can have a multitude of aims and objectives largely; it is studied to allow a person to enter a specific field of employment. Other aims for studying Biology are intellectual, ethical and pragmatic: to increase knowledge about all types of organisms, to encourage greater benevolence in the relationship between humans and the natural environment and to implement biological skills into various technologies or management techniques (Heather, 2007). The study of Biology aims to increase understanding of living systems and to allow one to consider the systems in relationship to the self and other organisms in the natural environment. Biology has many applications, in the natural environment. Studying Biology however allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients.

The major objectives of Biology education in Nigeria are;

- To provide the youth with sound knowledge of the basic principles and techniques of Biology.
- To produce knowledgeable, highly motivated, professional and effective teachers of Biology who will be able to develop in students an appreciation and understanding of biological processes and principles.
- To develop confidence in Biology teachers and enhance the ability to adapt to the changing situation in science and the technological oriented society.
- To demonstrate excellence and professional competence in teaching secondary school Biology.

Impact of Language

It is well known that language plays a cardinal role in determining the degree of understanding of biological concepts (Lemke, 1990 in Bennett, 2003). Language is what communicates the ideas to the pupils, and that if the language is not learner-friendly; pupils will inevitably experience learning difficulties in Biology. This means, as Bennett, (2003) observes that understanding science is more than just knowing the meaning of particular words and terms but making meaning through exploring relationships among the words used. It is therefore inferred that as long as the pupils fail to grasp the relationships among key biological terms under discussion, they will always have problems in conceptualizing what is being taught. Failure to understand the language associated with the biological terms gives rise to failure to grasp the biological concepts (Young, 1999).

Biology uses difficult vocabulary which is not only vast but also technical. Bennett (2003) observes that technical vocabulary associated with biological concepts has proved to be responsible for reducing the readability and understandability of the biological text which very often results in poor conceptualization. It has been observed that there is common understanding among researchers that such concepts as genetics, meiosis and mitosis are rich in terminologies, yet not all of the terms are necessary for adequate understanding. This situation makes pupils become disinterested in the concepts and unwilling to memorise facts. Knippels (2002) holds the same views as Bennett (2003) that even the teachers and authors of curriculum materials do not always use terms in Biology (especially in genetics) consistently and explicitly. This scenario accounts for the confusion that causes very poor absorption of biological ideas. However, it would be argued here that the failure on the part of the teachers and authors to use the biological terms consistently would not necessarily lead to the failure on the part of the pupils to grasp the biological concepts. What would lead to the

failure by pupils to understand the biological concepts is their failure to master and comprehend the vocabulary that is vital to understanding.

Specialist vocabulary of Biology

Barnes (1969) as cited by Bennett (2003) highlights the failure on the part of the teachers to explain to the pupils what Bennett refers to as 'specialist vocabulary' prior to actual learning. This probably implies that the inability of the teachers to explain 'specialist vocabulary' surrounding biological concepts is a clear manifestation of their inadequate understanding of the difficult topics such as genetics and DNA synthesis. It is easy to see the implication in the authors' statement that if teachers have a vague idea of what they want to teach, how much more shall the pupils fail to understand the same concepts? (Bahar and Polart, 2007) as cited by Ogunkola and Samuel (2011) point out that the many difficult terms and symbols used in the teaching of sciences are so new that they cannot be linked to the pupils' cognitive structures. The authors seem to emphasize the point that pupils' ability to comprehend some Biology concepts is virtually blocked by the fact that they have had no experience with the new terms.

This is also well explained by the theoretical frame work used in this study, that the construction of ideas and meaning of what pupils learn largely depends upon their prior knowledge and environment they are operating in. In a study conducted by Cassels and Johnston (1985) to explore pupils' understanding of the 95 words judged to be the most troublesome in science lessons, it was discovered that many words were poorly understood by pupils. Looking at this, one might then ask, how the pupils would comprehend the concepts in Biology if the vocabulary used is not understood. This is one factor which results in poor pupils' performance in Biology (Johnston 1985 in Bennett, 2003). One other factor related to language barrier in learning Biology is 'science literacy' which Ramsden (1997) and Collins (2001) say pupils find not only difficult but also boring.

Writing in Biology and other sciences exerts additional linguistic demands on pupils by requiring them to express themselves more coherently, and that this is compounded by the conventional use of impersonal language in reporting. But teachers can easily go round this obstacle by allowing pupils to communicate in their own style. If the pupils, as Britton et al (1975) observe, are allowed to use language in more informal ways, their understanding of difficult concepts would be enhanced.

Experience

Graduating in a degree of teaching is not that much tough as getting mastery in experience. Experience holds an important place when you are teaching students. Some aspirants acquire high qualifications which can make them qualified for teaching but lacking in experience hamper their progress. With high qualifications, teachers can get a better understanding of the different topics or complex formulas but experience helps teachers to deal with the students and prepare them for how to teach students.

Subject matter

There comes a time when teachers who do not have knowledge of a particular subject are assigned to teach that subject. In such a situation, passion and motivation to research about the topic and teach students help them. Subject matter does really matter. However, the chances of assigning subjects which are not the forte of a teacher are very rare.

The syllabus of the subject is formed by educationalists and psychologists keeping the mental and physical capabilities of students in mind. The important subject matter related factors which influence teaching are the difficulty of the task, length of the task, meaningfulness of the task, similarity of the task, organized material, and life learning

Teachers' Academic Qualification

Research conducted by David et al. (2012) suggested that teachers play an important role of an implementer in the classroom. Teachers are recognized as critical factors in the delivery of

quality education, and this is why there is a need for improvement in the level of abilities in teachers for them to effectively teach sciences in our schools. The results indicated that if some topics in science were difficult to pupils, it might be the fault of those who present them badly. If the teacher does not have the suitable qualification to offer Biology to the grade level s he or he is teaching, their difficulties would spill over to the pupils. It is difficult for the pupils to grasp the concepts that the teacher fails to understand. Poorly qualified teachers are very likely to transmit wrong descriptions of observations, misconceptions, misinformation and misapplication of content taught and scientific terminologies.

Strategies for an improvement for effective teaching of Biology

According to Euro pass Teacher Academy (2021) the following are highlighted:

Self-evaluation

Change and evolution require self-awareness. Educators must cultivate the ability to see themselves clearly and objectively through reflection and self-analysis. This way, they see what is happening around them, learn from the situation, and can be able to make the necessary adjustments.

We can divide this process of self-evaluation into three fundamental phases:

- First, a teacher must recognize there is a need for change, both within and around them. Detecting that something goes wrong it is the first step towards improvement;
- Secondly, they have to determine what areas of their teaching need the most attention. Before setting their goals, they have to figure out which are their strengths and weaknesses;
- Thirdly, they must decide on key areas of growth and commit to them.

When it comes to reflecting on the classroom experience, the students' small clues and positive feedback is a rich source of information. That is, paying attention to what students comment in class is an effective way to find out strengths. Usually, we can find that there are recurring themes of conversation which can help identify what is working well or not.

Finding the positive in the students' daily evaluations is a sure way to:

- Pinpoint which strategies are the best to engage their attention and interest;
- Consider the implementation of small progressive changes.

In conclusion, self-evaluation is a critical step in any process of growth and change. Generally, the path towards improvement becomes clearer when a teacher is willing to admit mistakes and put their students' needs first.

Pedagogical learning

Teachers' efficacy is, arguably, the product of three aspects:

- Deep knowledge of the subject-matter or content area;
- Professional experience;
- Development of teaching skills.

Consequently, due to the fast changes in technology and society, an educator must brush up on their pedagogy to stay relevant. Those changes greatly affect the way students learn and the way teachers teach, so there is always room for pedagogical improvement. As a result, learning "how to teach" and "how students learn" become priorities in a teacher's journey towards significant growth.

- In order to improve the way they teach, an instructor can focus on these tasks:
- Brush up on the basics; that is, come back to what they once learned but it is now partly forgotten, and renew those skills;
- Learn about new theories which can provide useful information about how people learn best;
- Learn about new teaching strategies and techniques which can be actually implemented in the classroom;

- Improve the way they differentiate instruction in order to meet the individual learning needs of each student. This way, all students have the same opportunities to reach the common learning goals.

We can safely affirm that methodology is at the core of the success of the learning and teaching process; so, studying the best approaches and adapting them effectively to their classroom's idiosyncrasies is a course of action worth being taken by any committed teacher.

Continuous Learning

Being a dedicated teacher means going through a lifelong learning process. So, an educator who has a clear sense of improvement and progress should consider continuous learning a priority. In order to maintain and improve efficiency, educators should keep themselves up-to-date regarding instructional methods, educational technology, the curriculum, etc.

Furthermore, another powerful reason for never stopping learning is to avoid burning out and demotivation. Undoubtedly, going the extra mile to keep teaching practices fresh and engaging helps foster a successful learning environment.

What can teachers do to keep learning?

- Participate in workshops, seminars and courses;
- Group with other educators who are open to share their ideas, methods and techniques;
- Observe colleagues' classes:
- Learn what works for students from a delivery standpoint
- Focus on teacher-student interaction to learn what pulls the class into the lesson.

The classroom experience is extremely rich and complex. So, teachers should:

- Gather useful information from all resources available in order to face their daily tasks properly armed with adequate tools;
- Take away from those sources all that are meaningful and can impact their work for the better.

Cognitive learning theory Jean Piaget and Vygotsky

This study is premised on the theory of constructivism as expounded by Jean Piaget and Vygotsky. The formation of this theory is generally attributed to Jean Piaget who explained the mechanism by which knowledge is internalized by pupils. He suggested that through the process of accommodation and assimilation, individuals construct their own knowledge from their experiences and during assimilation they incorporate the new experiences without changing the already existing frame work. This occurs when the individual's experiences are aligned with their internal representation of the world. The exponents postulate that pupils construct their own knowledge, ideas and meaning from their experiences (Bennett, 2002; Vygotsky, 1978).

The theory of constructivism holds that:

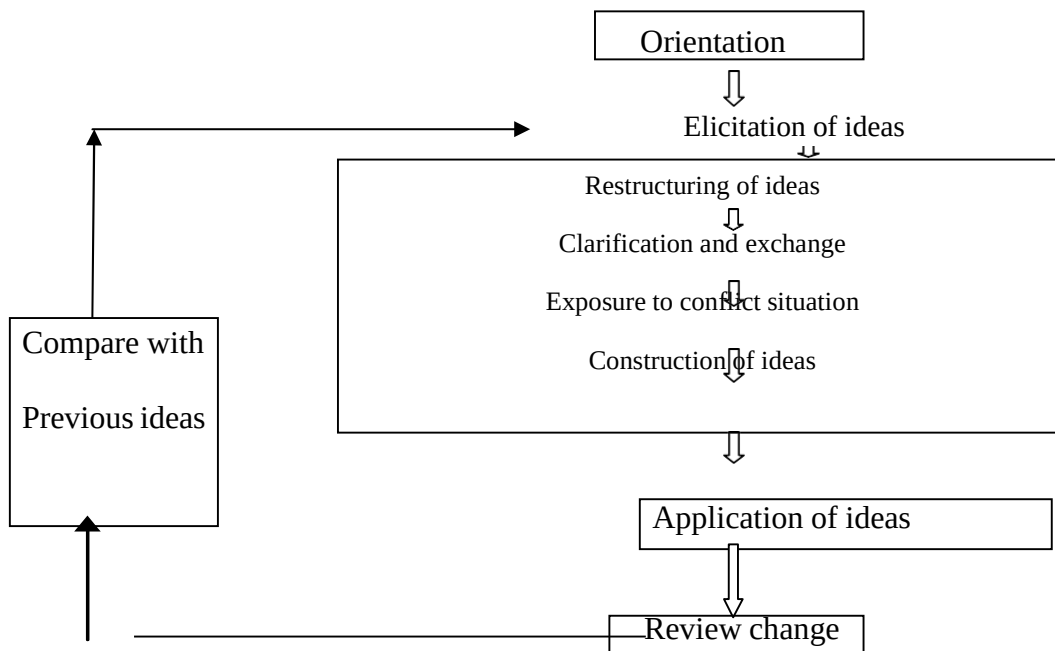
- Learning outcomes depend not only on the learning environment but also on the knowledge of the learner;
- Learning involves constructing meaning; Construction of a meaning is influenced to a large extent by existing knowledge;
- The meanings constructed are evaluated and can be accepted or rejected;
- There are patterns in the types of meanings pupils construct due to shared experiences with the physical world and through their natural language (Bennett, 2002; Vygotsky, 1978).

This theoretical framework is appropriate because it clearly explains why pupils would fail to understand the difficult biological concepts as their complexity bears no relationship with the student's existing knowledge. Simply put, the strange and difficult 'specialist vocabulary' that characterize some biological concepts or topics will cause a failure on the part of the student

to construct their ideas or meaning of these concepts as the relevant knowledge is absent. Construction of meaning depends upon the already existing knowledge in the learner and their experience with the learning environment. The complex biological terms and concepts such as genetics, nervous system and other related concepts would be deemed as not being part of the learning environment with which the pupils has had experience.

There is considerable research evidence to support the notion that children construct their own explanations for scientific phenomena and that such explanations may differ from the accepted scientific explanations. Areas where this has been demonstrated to be the case include: photosynthesis, respiration, biological classification, evolution (Bennett, 2012). Figure 1.1 below shows how an individual who is exposed to a learning experience constructs his or her ideas and meaning which undergo restructuring, clarification and evaluation before accommodation of the new ideas.

Figure.1.1 Process of knowledge construction and accommodation



(Source: Bennett, 2002)

The theory suggests that as long as some topics remain alien, complex in terms of terminologies, and the pupils lack prior knowledge, the pupils will certainly fail to construct meaning and make sense out of their learning experiences. This is so because construction of knowledge, ideas or meaning largely depends upon the already existing knowledge in the student. It is therefore, as Bennett (2002) puts it, important for the pupils to be exposed to an environment of elicitation of ideas in the biological topics that have been demonstrated to cause difficulties for the pupils because they hold ideas or patterns of ideas which differ from the accepted scientific explanations.

Review of Empirical Studies

Chavan, R. (2016) reported the difficulties in teaching Biology concepts by science teachers at upper primary school. The study was descriptive in nature. The VI, VII & VIII grade science textbook Biology content was analyzed by the content analysis technique and

important Biology concepts was identified. It is found that science teachers faced difficulties in comprehension of biological concepts like cell, sporogenesis, segmentation, etc.

Samuel and Babola (2011) studied science teachers and students perception about the difficult topics in the integrated science curriculum of lower secondary schools in Barbados. It is found that the certain science topics are perceived to be more difficult than other and this issue is related to science teachers' classroom teaching. It is found that some science concepts are abstract and concrete in textbook, so difficult for teachers to provide concrete experience for the students to facilitate more effective learning. This is a major source of student's misconception.

Abimbola (1998) studied "Teachers perceptions of important and difficult Biology content secondary schools in Kwara state; it is found that applied Biology" is an important concept perceived by the teachers. Ecology, chromosomes, cellular, growth and heredity, are the concepts perceived as difficult to teach by the teachers.

Finely et al. (1982) studied the teacher's perceptions of important and difficult science content. The results of the study reported that in Biology photosynthesis, mitosis, meiosis, cellular respiration, chromosome concepts were found to be difficult to teachers and its creates alternative concepts in students.

Summary of Review of Related Concepts and Literature

Literature showed that there are several gaps that cause the teachers to fail to understand some topics in Biology. These gaps include: language and vocabulary used, experience, subject matter and teachers' qualification. This study is intended to bridge some of these gaps. In the theoretical studies, constructivism as expounded by Jean Piaget and Vygotsky; the formation of this theory is generally attributed to Jean Piaget who explained the mechanism by which knowledge is internalized by pupils. He suggested that through the process of accommodation and assimilation, individuals construct their own knowledge from their experiences and during assimilation they incorporate the new experiences without changing the already existing frame work. The theory of constructivism holds that; learning outcomes depend not only on the learning environment but also on the knowledge of the learner; learning involves constructing meaning; Construction of a meaning is influenced to a large extent by existing knowledge; the meanings constructed are evaluated and can be accepted or rejected; there are patterns in the types of meanings pupils construct due to shared experiences with the physical world and through their natural language (Bennett, 2002; Vygotsky, 1978).

Empirically, four studies relating to the present study were reviewed. Among all the studies reviewed, the general findings were that science teachers faced difficulties in comprehension of biological concepts like cell, sporogenesis, segmentation, etc. It was found that certain science topics are perceived to be more difficult than other and this issue is related to science teachers' classroom teaching. It is found that some science concepts are abstract and concrete in textbook, so difficult for teachers to provide concrete experience for the students to facilitate more effective learning. This is a major source of student's misconception. Also, it was found that 'applied Biology' is an important concept perceived by the teachers. Ecology, chromosomes, cellular, growth and heredity, are the concepts perceived as difficult to teach by the teachers.

Finally, Biology photosynthesis, mitosis, meiosis, cellular respiration, chromosome concepts were found to be difficult to teachers and it creates alternative concepts in students.

Research Gap: Much of the studies available covered areas outside the country, and those focusing in Nigeria were done in states other and Anambra state where Aguata Local Government Area, the area focused by this study, is located. Therefore, this study set out to fill those gaps relating to inconsistency and lack of continuity in investigations.

Research Methodology

This chapter deals on the procedure that guided this study. It is organized under the following sub-headings:

- Design of the study
- Area of the Study
- Population of the Study
- Sample and Sampling Techniques
- Instrument for Data Collection
- Validation of Instrument
- Method of Data Collection
- Method of Data Analysis

Research Design

This study adopted descriptive survey research design. According to Mbah and Udegbe (2013) it is a type of research design that aims to obtain information to systematically describe a phenomenon, situation or population. The design was used because data were collected from the entire population using questionnaires.

Area of the Study

The area of the study is Aguata Local Government Area of Anambra State.

Population of the Study

The population of the study is thirty-six (36) Biology teachers in twenty-one (21) government secondary schools in Aguata Local Government Area, Anambra State.

Sample and Sampling Technique

There was no sampling, the entire population was used. Thus, census method was adopted because the entire population was used.

Instrument for Data Collection

The four point scale was used for the study which was assigned numerical value as follows;

Very Difficult	-	VD	4 points
Difficult	-	D	3 points
Less Difficult	-	LD	2 points
Not Difficult	-	ND	1 point

Respondents were asked to indicate their opinion in the statements made by ticking (✓) in the right option. The instrument used for data collection was a structured forty (40) items questionnaire.

Validation of Instrument

The questionnaire was validated by two lecturers from School of Sciences (Biology Education Department) and one from School of Education (Measurement and Evaluation). These individuals were given the topic, purpose of the study, research questions and instrument. They were requested to scrutinize the instrument in terms of relevance, clarity, content coverage and appropriateness in addressing the research questions. They (the three experts) made useful contributions that helped in producing the final copies of the instrument.

Method of Data Collection

The administration of thirty-six (36) structured questionnaires was done by the researcher and it was distributed to all the Biology teachers in all the twenty-one (21) secondary schools in Aguata Local Government Area with the help of a research assistant and all were collected on the spot.

Method of Data Analysis

The data was analyzed using mean and standard deviation to answer the four research questions and t-test was used to test the hypothesis at 0.05 level of significance. The mean ($\bar{X}$) was calculated using the formula;

$$\text{Mean } (\bar{X}) = \frac{\sum FX}{\sum F}$$

Where;

$\bar{X}$ = Mean

Σ = Summation

F = Frequency

X = Score of individual respondent (nominal score)

N = Total number of respondents

The researcher also uses the range for clarification purposes;

Very Difficult (VD) - 4.00 - 5.00

Difficult (D) - 3.50 - 2.50

Less Difficult (LD) - 2.40-1.50

Not Difficult (ND) - 1.49 – below

Thus,

$$\text{Mean } (\bar{X}) = \frac{4+3+2+1}{4}$$

$$\therefore \bar{X} = 2.5$$

Thus, cut off point (mean) = 2.5

Also, the standard deviation was calculated using the formula;

$$SD = \sqrt{\frac{\sum F(X - \bar{X})^2}{N}}$$

Where;

SD = Standard deviation

Σ = Summation

F = Frequency

X = Score (nominal score)

N = Total sample of population

The hypothesis was tested at 0.05 level of significance using t-test.

$$t = \frac{\bar{X}_f - \bar{X}_m}{\sqrt{\frac{(SD_f)^2}{N_f} + \frac{(SD_m)^2}{N_m}}}$$

Where;

$\bar{X}_f$ = Grand mean response of female Biology teachers

$\bar{X}_m$ = Grand mean response of male Biology teachers

SD_f = Standard deviation of female Biology teachers

SD_m = Standard deviation of male Biology teachers

N_f = Number of female Biology teachers

N_m = Number of male Biology teachers

Decision Rule:

Since the cut off mean is 2.5, any item receiving a mean rating scale of 2.5 and above is acceptable and a mean rating score below 2.5 is rejected. For testing the null hypothesis, the t-calculated and t-critical values were considered. If $t_{cal} > t_{crit}$ at 0.05 level of significance reject the null hypothesis, otherwise accept. Here, the t-critical value is 1.98

DATA PRESENTATION AND ANALYSIS

This chapter deals with the presentation, analysis and interpretation of data collected. The data collected were presented and analysed in statistical tables showing the mean and standard deviation response scores of the respondents. The table has been grouped with respect to the four (3) research questions.

Research Question One: What Biology content areas do teachers identified as difficult in senior secondary schools in Aguata Local Government Area?

Table 1: Mean Response of the Respondents on the Biology content areas teachers identified as difficult in senior secondary schools in Aguata Local Government Area.

S/N	ITEM STATEMENTS	VD	D	LD	ND	N	$\bar{X}$	SD	REMARK
1	Sense organs	-	-	14	22	36	1.39	5.62	ND
2	Aquatic habitat (marine habitat)	-	3	11	22	36	1.47	5.01	ND
3	Ecology of populations	-	1	9	26	36	1.31	4.98	ND
4	Reproductive behaviours	1	-	24	11	36	1.75	7.87	LD
5	Reproductive system	-	2	4	30	36	1.22	5	ND
6	Terrestrial habitat	-	3	13	20	36	1.53	5.27	LD
7	Biology of heredity (Genetics)	20	10	6	-	36	3.39	13.60	D
8	Fruit	-	5	11	20	36	1.58	5.11	LD
9	Regulation of internal environment	5	8	12	11	36	2.19	6.12	LD
10	Transport system	-	1	16	19	36	1.5	5.87	LD
11	Nervous co-ordination	7	12	17	-	36	2.72	8.71	D
12	Respiratory system	-	-	14	22	36	1.39	5.62	ND
13	Development of new organisms	5	8	18	5	36	2.36	7.30	D
14	Tissues and supporting system	-	-	12	24	36	1.33	5.35	ND
15	Excretory system	-	3	25	8	36	1.22	8.31	ND
16	Digestive system	-	3	26	7	36	1.22	8.61	ND
17	Variations in population	3	13	16	4	36	2.42	8.01	LD
18	Some properties and function of the cell	-	-	6	30	36	1.17	5.14	ND
19	The cell and its environment	-	-	5	31	36	1.14	5.20	ND
20	Adaption for survival	-	-	16	20	36	1.44	5.97	ND
21	Evolution	5	10	20	1	36	2.53	8.28	D
Overall Mean							1.73		LD

From the table 1 above, it was discovered that the identified contents areas in research item statements 1-21 respectively were not very difficulty, the identified contents areas in research item statements 7, 11, 13 and 21 with mean responses 3.39, 2.72, 2.36 and 2.53 respectively were difficult, the identified contents areas in research item statements 4, 6, 8,9,10 and 17 with mean responses 1.75, 1.53, 1.58, 2.19, 1.5 and 2.42 respectively were less difficult also, the identified contents areas in research item statements 1, 2, 3, 5, 12, 14, 15, 16, 18, 19 and 20 with mean responses 1.39, 1.47, 1.31, 1.22, 1.39, 1.33, 1.22, 1.22, 1.17, 1.14 and 1.44 respectively were not difficult. The overall mean of 1.73 implies that teachers who identified

a concept as a difficult concept are likely to deliberately skip teaching of the topic and where that is not the possible topic is likely to be chaotically taught.

Research Question Two: What are the factors responsible for making the identified content areas difficult?

Table 2: Mean responses of the respondents on factors responsible for making the identified content areas difficult.

S/N	ITEM STATEMENTS	SA	A	D	SD	N	$\bar{X}$	SD	REMARK
22.	Unavailable instructional materials	10	25	-	1	36	3.22	13.46	Agree
23.	Inadequate teachers' education curriculum	5	30	-	1	36	3.08	14.77	Agree
24.	Complexity of topics	11	25	-	-	36	3.31	13.76	Agree
25.	Inadequate preparation of Biology teachers	4	30	1	1	36	3	14.66	Agree
26.	Lack of equipped laboratory for practical teaching	18	18	-	-	36	3.5	14.21	Agree
27.	Insufficient time allocation to teach topics	14	16	6	-	36	3.22	11.56	Agree
28.	Abstractness of Biology topic	14	15	6	1	36	3.17	11.34	Agree
29.	Lack of adequate training/refresher courses	10	25	1	-	36	3.25	13.45	Agree
30.	Poor commitment to work	5	20	10	1	36	2.81	10.36	Agree
31.	Poor knowledge of the topics	20	13	2	1	36	3.44	6.55	Agree
32.	Misconception of some topics	4	26	6	-	36	2.94	12.80	Agree
33.	Biology curriculum is too wide (voluminous)	20	16	-	-	36	3.56	14.46	Agree
Overall Mean							3.21		Agree

From table 2, teachers agreed on all the 22-33 items identified as factors that can make Biology concepts to be identified as difficult concepts by the teachers (mean ≥ 2.5).

Research Question Three: What strategies could be employed in solving the problem of difficult content areas in Senior Secondary Schools Biology as perceived by the teachers?

Table 3: This table shows the mean responses of the respondents on strategies to be employed in solving the problem of difficult content areas in Senior Secondary Schools Biology as perceived by the teachers

S/N	ITEM STATEMENTS	SA	A	D	SD	N	$\bar{X}$	SD	REMARK
34.	Biology laboratories should be adequately equipped	17	19	-	-	36	3.47	4.34	Agree
35.	School management should constantly organized workshop, training, and conference for Biology teachers to update their knowledge	16	20	-	-	36	3.44	13.83	Agree

36.	Teacher's teamwork and reflection should be encouraged	11	25	-	-	36	3.31	13.76	Agree
37.	Teachers should be sensitized to make a personal effort to develop themselves adequately	6	30	-	-	36	3.17	14.90	Agree
38.	Teacher's education curriculum should be overhauled to include revision of some concepts in the senior school curriculum	3	33	-	-	36	3.08	16.07	Agree
39.	Connect Biology to other learning areas	18	18	-	-	36	3.5	14.21	Agree
40.	Frequent joint review by teachers	20	16	-	-	36	3.56	14.76	Agree
Overall Mean							3.36		Agree

From table 2, teachers agreed on all the strategies that could be employed in solving the problem of difficult content areas in Senior Secondary Schools Biology as perceived by the teachers(mean ≥ 2.5).

Hypothesis

H₀₁: There is no significant difference in the content areas male and female Biology teachers identified as difficult to teach in senior secondary schools.

Table 4: Two tailed t-test of the significant difference in the mean response of male and female Biology teachers on the content areas they identified as difficult to teach in senior secondary schools.

Categories	Mean ($\bar{X}$)	SD	N	Df	t-cal	t-crit	Decision
Male	1.88	3.57	12	34	0.09	1.98	Not significant
Female	1.74	5.48	24				

Table 4, showed t-cal (0.09), t-crit (2.03), df (34), mean response of male (1.88) and mean response of female (1.74). From this, t-calculated value was less than t-critical value ($t_{cal} < t_{crit}$), therefore at $p < 0.05$ the null hypothesis was upheld indicating that, there was no significant difference between the male and female teachers perception of difficult topics in Biology.

Summary of Major Findings

From the analysis of the respondents' responses, the following were discovered:

- Teachers who identified a concept as a difficult concept are likely to deliberately skip teaching of the topic and where that is not the possible topic is likely to be chaotically taught.
- Teachers agreed on all the items identified as factors that can make Biology concepts to be identified as difficult concepts by the teachers.

- Teachers agreed on all the strategies that could be employed in solving the problem of difficult content areas in Senior Secondary Schools Biology as perceived by the teachers.
- The null hypothesis was accepted that is, there is no significant difference in the mean response of male and female Biology teachers on the content areas teachers identified as difficult to teach in senior secondary schools.

Discussions Of Findings

This chapter is discussed under the following sub-headings

- Discussions of Findings
- Implications of the findings
- Recommendation
- Limitations of the Study
- Suggestion for further Studies
- Conclusion

Discussion of Findings

From the study and analyses of research Question one, the teachers identified the following as difficult concepts in senior secondary school Biology curriculum; reproductive behaviours, terrestrial habitat, Biology of heredity (Genetics), fruit, regulation of internal environment, transport system, nervous co-ordination, development of new organisms, variations in population, evolution. These finding mention that of Ariyo (2014) who discovered that some Biology teachers perceived difficult to teach in some selected topics from the senior secondary school Biology syllabus.

Research question two sought to find out the factors responsible for making the identified content areas difficult. The result from table (2) shows that the teachers identified the following as the factors responsible for making the identified concept difficult; unavailable instructional materials, inadequate teachers' education curriculum, complexity of topics, inadequate preparation of Biology teachers, lack of equipped laboratory for practical teaching, Insufficient time allocation to teach topics, abstractness of Biology topic, lack of adequate training/refresher courses, poor commitment to work, poor knowledge of the topics, misconception of some topics, Biology curriculum is too wide (voluminous). This finding is in line with that of {Jimoh, (2003); Kolawole, & Oluwatayo, (2004); Aminu, (2005); Maliki, Ngbani, & Ibu, (2009) & Adeleke, (2007)} who found that inadequate teacher education curriculum, inadequate seminars/ workshop for teachers and teachers' inability to develop themselves to update their knowledge in their specialized areas constitute teachers' ineffectiveness in the classroom.

Research question three revealed that the teachers agreed on the strategies that could be employed in solving the problem of difficult content areas in senior secondary schools Biology as perceived; adequately equipped Biology laboratories, constantly organized workshop, training, and conference for Biology teachers to update their knowledge by school management, encouraging teacher's teamwork and reflection, teachers sensitization to make a personal effort to develop themselves adequately, teacher's education curriculum should be overhauled to include revision of some concepts in the senior school curriculum, connecting Biology to other learning areas and frequent joint review by teachers. This corroborated the finding of Olorundare and Oni, (2016) who found Teachers' Perception of difficult Biology concepts and factors responsible for such perception.

From the study, the null hypothesis revealed that at $p < 0.05$ there was no significant difference in the mean response of male and female Biology teachers on the content areas they identified as difficult to teach in senior secondary schools, this finding is a line with Ariyo (2014) and Osuagwu (2013).

Implication of the Findings

The implication of these research findings is that without this research, true identification and strategies for improvement about senior secondary school Biology content areas perceived to be difficult by teachers cannot be made. Teachers who identified a concept as a difficult concept are likely to deliberately skip teaching of the topic and where that is not possible, the topic is likely to be chaotically taught. Learners will continue to lose interest in Biology and cause students or class of students to experience significant setbacks.

Recommendations

In view of the findings presented and discussed in this study, it is recommended that:

- Government should employ qualified and experienced Biology teachers for effective teaching and learning of Biology in senior secondary schools
- School should be provided with well-equipped laboratory for regular practical
- Adequate instructional materials should be provided by government or through improvisation by the teachers at secondary level.
- Teacher education curriculum should be overhauled to include revision of some concepts in the senior secondary school curriculum
- Teachers should be sensitized to make a personal effort to develop themselves adequately in their specialized subjects.
- School management/ ministry of Education should constantly organize workshop, training, and conferences for Biology teachers to update their knowledge.

Limitations of the Study

This research work was limited with some certain factors which include; finance, stress in combining school activities with project.

In distribution of the questionnaires, some feel reluctant to tick the questionnaire but after much talking and persuading at the end they complied.

However, despite these challenges, the quality of the research work was not in any way affected.

Suggestion for further studies

There were issues that emerged from this study which would necessitate further research. Below are some suggestions for further studies.

- An investigation into the impact of the teachers' qualification on the effective teaching Biology.
- An investigation on the extent to which Biology teachers formatively assess their lessons.

Conclusion

Based on the findings of the study, the results of the study have established that Biology teachers find some concepts difficult in the Senior Secondary School curriculum.

The study has shown that teachers found the aforesaid topics difficult to learn due to a number of reasons which, among many others, include: unavailable instructional materials, inadequate teachers' education curriculum, complexity of topics, inadequate preparation of Biology teachers, lack of equipped laboratory for practical teaching, Insufficient time allocation to teach topics, abstractness of Biology topic, lack of adequate training/refresher courses, poor commitment to work, poor knowledge of the topics, misconception of some topics, Biology curriculum is too wide (voluminous).

Notwithstanding the identified difficult concept areas that the teachers experienced in Biology, the study showed that use of effective strategies could greatly lessen the teaching difficulties. These strategies included: adequately equipped Biology laboratories, constantly organized workshop, training, and conference for Biology teachers to update their knowledge by school management, encouraging teacher's teamwork and reflection, teachers sensitization to make a

personal effort to develop themselves adequately, teacher's education curriculum should be overhauled to include revision of some concepts in the senior school curriculum, connecting Biology to other learning areas and frequent joint review by teachers.

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