EFFECT OF IMPROVISED MODEL OF HUMAN BRAIN ON THE ACADEMIC ACHIEVEMENT OF BIOLOGY STUDENTS IN BOSSO LOCAL GOVERNMENT AREA OF NIGER STATE

BY

ANDA, Simpa Alex

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ABSTRACT

This study investigated the effect of improvised split and align model of Human Brain on the academic achievement of biology students. Two research questions and two null hypotheses guided the study. The review of literature in the study was organized under conceptual framework, theoretical framework and review of empirical framework. A quasi-experimental design was adopted for the study, specifically, the non-equivalent pre-test and post-test control group type. The study was carried out in Bosso local government area of Niger state. The sample for the study comprised of one hundred and thirty-one (131) students drawn from the population of study. Two treatment groups were used for this study; the experimental and control groups. The treatments lasted for four weeks. The instrument for data collection in this study was a Biology Achievement Test (BAT). Data collected from the field work questions were analyzed using mean, standard deviation and t-test to test the hypotheses at 0.05 level of significance. The results revealed that students taught biology using improvised split and align model of human brain performed better than those taught using conventional teaching method. The study also found out that, the use of improvised split and align model of Human Brain in teaching biology is gender friendly. There is significant difference between the academic achievements of student taught biology using improvised split and align model of Human Brain and those taught using conventional teaching method. In line with the findings of the study, the educational implications were highlighted and recommendations made which include among others that biology teachers should try to improvise instructional materials for teaching biology. Finally, recommendation of the study and suggestions for further studies
were made.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Science is the bedrock on which modern day technological breakthrough is hinged. Different authors according to their own understanding have defined Science. Igwe (2003) defined science as a systematic study of the nature and behavior of the material and physical universe through observation, experimentation, measurement and recording. In addition, Esu (2004) defined science as a systematic, precise, objective way to study the natural world. Science is a dynamic human activity concerned with understanding the workings of our world (Ogunleye 2006). This understanding helps man to know more about the universe. Without the application of science, it would have been difficult for man to explore.

The usefulness of science cannot be under-rated. There are many areas of life that science has contributed such as in medicine, geophysics, hydrology, agriculture, communication, technology, education, transportation, healthcare to mention but a few. Agriculture has improved greatly through the introduction of high yield improved agricultural seeds. Science has led to breakthrough in medical care. Diagnostic machine for checking different ailments and diseases are now controlled and diseases cured through science. In recent times, countries all over the world, especially the developing ones like Nigeria, are striving hard to develop technologically and scientifically, since the world is turning Scientific and all proper functioning of lives depend greatly on Science. Central to science is biology.

Biology is defined as the study of living things which include plants and animals. It is a fascinating study that ranges from microscopic-cellular molecules to the biosphere, encompassing

the earth's surface and its living organisms (Sarigin, 2010). It is one of the core science subjects that senior secondary school students offer at the senior levels in the Nigerian secondary schools, (FRN, 2004). Biology is a very important science subject and a requirement for further learning of a number of science-related professional courses like medicine, agriculture, pharmacy, and others. One of the roles of Biology can be seen in medicine, where it helps the students to understand the useful plants and animals substances which are used for medicine. It also helps the students with better knowledge and understanding of the concepts of health and disease as, most of the disease condition find its solution by biological knowledge. As a result, students are being encouraged to take up science-related subjects.

Today, Biology pervades literally every field of human endeavor, and plays a fundamental role in educational advancement. This is seen in all the technological advancement in the world today, which is because of scientific investigations. However, the issue remains that in most secondary schools in Nigeria, there is high rate of failure in the subject. This situation has been a source of concern to all stakeholders in Education. The situation has consequently given rise to many researches on the cause of the failure in biology among the students. Majorly among the reasons advanced include, low interest of students in biology, inadequate motivation from teacher, poor incentives to biology teachers, lack of adequate supply of instructional material, lack of qualified teachers, use of teacher centered instructional strategies, inadequate use of instructional materials and use of abstract standardized materials. Nsofor (2010) noted that biology concept which are abstract and complex are presented to students by "mere wave of hands" and not accomplished with instructional materials. Nsofor in continuation called for effective teaching through the use of instructional material. Effective teaching of any subject will not only stimulates

student's interest in the subject but also enhance their achievement in the examination. To achieve effective teaching and learning process, there is indeed the need for use of instructional materials.

Instructional Materials, also known as Teaching/Learning Materials (TLM), are any collection of materials including animate and inanimate objects and human and non-human resources that a teacher may use in teaching and learning situations to help achieve desired learning objectives (Lewis, Beth 2018). Instructional materials may aid a student in concretizing a learning experience so as to make learning more exciting, interesting and interactive. They are tools used in instructional activities, which include active learning and assessment. The term encompasses all the materials and physical means an instructor might use to implement instruction and facilitate students achievement of instructional objectives. Instructional materials are wide varieties of equipment and materials use for teaching and learning by teachers to stimulate self-activity on the part of the students. Basically, the use of these instructional materials have made it easier for the students and teachers to communicate in the teaching-learning process, based on the fact that these materials are more practical and self-explanatory to the students.

The essence of producing instructional materials, is to facilitate the teaching learning process and not to be used as objects of decoration in the classroom or as objects to be presented during award winning national exhibitions. This implies that if the essence of producing instructional materials is to facilitate teaching learning, it therefore seems logical that the best approach to adopt in any production exercise is to predict out production on research findings on how individuals learn. Hence, for a classroom teacher, who wants .to produce instructional materials, his production has to be based on sound principles. Nsofor 2010 made it clear that instructional materials play the following roles in teaching learning process: It supplies a concrete basis for conceptual thinking and reduce meaningless work responses for students as it makes

learning more permanent, it has a high degree of interest for the learner; for they offer a reality of experience, which stimulates self-activity on the part of students, it develop a continuity of thought, this is especially true of motion pictures, as they provide experiences not, easily obtained through other materials and contribute to the efficiency and variety of learning. Therefore, the use of instructional materials in teaching/learning process exposes the learner to primary experiences and this enriches learning.

As important as instructional materials are, studies have shown that they are not available in schools. Consequent upon this, Nsofor pointed out that the problem of lack of instructional materials in schools can be overcome through improvisation. According to Ajayi (2004), improvisation is the provision of alternatives to real things. Improvisation is the making of substitutes when the real equipment or material is not adequate or available (Okebukola, 2002). It is the art of providing and using alternative materials or resources in the absence of the real or factory made one. Oyediran (2010) also defines improvisation as the art of using materials or equipment obtained from local environment or produced by the teacher, and with the assistance of the local personnel to enhance instruction. In other to teach by inquiry method or use activity based instructions, improvisation is required since instructional materials seem not to be adequate (Okebukola, 2002). Bassey (2002) defined improvisation as the process of making equipment and materials by the students or by engaging the services of others in the absence of real or manufactured ones. Generally, improvisation of instructional materials is an attempt to adapt and make use of local resources in the teaching/learning process when the ready- made materials are not available or are in shortfall or not within the reach of users. The teacher and the students could produce the improvised instructional materials. According to Okebukola (2002), improvisation in the context of biology can be seen as the process of using alternative resources for enhancing

biology teaching in the absence of the real ones. The teacher initiates the production of the alternative resources, which is constructed by either the teacher or the local artisans such as carpenters, blacksmiths among others. The teacher may use the students for improvising some of the needed materials or equipments.

Improvisation is a technique of originating a very new tool, instrument, materials, device or modifying existing ones for serving a particular purpose. Improvisation of instructional materials in secondary schools for teaching/learning purposes cannot be over-emphasized. To be able to promote quality instruction in the school system, there is the need to pay attention to improvisation of instructional materials in the teaching/learning process. Esu (2004) however noted that improvisation demands adventure, creativity, curiosity and perseverance on the part of the teacher, such skills are only realizable through well-planned training programmed on improvisation. Fajola (2008) sees improvisation from the creativity involved. This creativity is substitution and construction. Substitution in improvisation simply implies the techniques whereby an already local material is used in place of a piece of equipment that is not available whereas construction involves making of a new instrument to serve in place of the unavailable original one, where substitution is not possible. Esu (2004), however asserted that improvisation provides connectivity between students abstracts and real experience of teaching and learning.

Improvisation is a teacher-oriented activity used to effectively carry out the teaching/learning process successfully. The use of teacher produced improvised instructional materials from the resources available in their immediate environment for instruction at this level brings students to real world of activities and may help students gain scientific skills. The use of improvised instructional materials for Biology teaching has been long advocated (Olumorin, 2004). Improvisation serves the following purposes in the education system: It reduces the money spent

on the purchase of equipment; ensures the realization of lesson objectives; helps in solving the problem of lack of equipment; gives room for a teacher to demonstrate his creative skills and gives room for the use of cheap local materials as alternatives to the expensive foreign ones (Olumorin, 2004). The researcher stated that improvisation encourages students towards the development of creative abilities; strengthen enquiry, discovery, investigative method in sciences; enables teacher to think of cheaper, better and faster methods of making teaching learning process easier for students; affords students the opportunity of becoming familiar with resources in their environment. The present study is a step in that direction, it geared towards improvisation of a split and align model of Human Brain.

Models are modified real things. It is the reproduction of coastly or delicate items that can be reproduced at reasonable coast and are safe to use. They are replicas of real objects which may be larger or smaller than the real thing. Models are excellent for teaching concept about things that are three-dimensional and concrete in nature. They can be made to show interior view of objects, and they can be simplified to any extent desired in order that the basic concept represented may be communicated most adequately. Split and Align model of human brain is represented in a three dimensional form, it has been carefully designed and constructed using a wooden material. The three main part of human brain have been carefully segmented and given different design with different colours for each segments so as to give proper identification to captivate the attention of the students and so that they will be able to identify each parts. This parts of the brain are detachable for identification and illustration purposes. They are all attached firmly on a wooden board frame. Perhaps this might enhance achievement irrespective of gender

Gender referrers to the roles and responsibility of men and women that are created in families, societies, and cultures. The concept of gender is the expectations held about the

characteristics, attitudes and likely behavior of both men and women (masculinity and feminity) in the society (Ezeh, 2013). There is a general belief among Nigerians that boys are superior to girls in terms of physical build-up, intelligence, and reasoning. According to Okeke (2007), gender and gender stereotyping has brought discrimination in academic achievement which is a matter of great concern to educationists. Adegboye (1998) observed that many parents do not want to spend much money on the education of females as on the education of males due to cultural and social reasons. The school knowingly or unknowingly creates a gap in gender activities. For example, the grouping of subjects in schools encourages stereotyping in the choice of subjects. The grouping of Food and Nutrition/Technical Drawing, Physics/Home management compels the females to choose Food and Nutrition and Home management while the males go for Technical Drawing and Physics. Some studies on gender and performance have shown that boys perform better than girls in science-related tasks. Examples include studies by Zirim (2006); Okwo and Otubar (2007) that indicated that science achievement depends on gender while other studies conducted by Nzewi (2010), Okoh, Iwuozor, and Obioma (2011), and Ogunleye and Babajide (2011) showed that gender is insignificant in science achievement. Since the findings of gender are inconclusive the researcher is interested in investigating the effect of split and align model of human brain on the academic achievement of biology students.

1.2 Statement of the Problem

Research findings have shown that the students enrolment into the subject Biology have been on the increase (Nsofor, 2010). This increase in enrolment is also not been accompanied or proportionate to the performance of the students. West African Exam Council (WAEC) and National Examination Council (NECO) result of 2015 showed that many students failed Biology. The chief Examiners reports specifically identified the functions and role of Nervous system to be

poorly answered by the students. Base on the above findings, the researcher felt that a more student's centered approach which requires the learner to actively participate in the teaching and learning process be adopted for the teaching of biology. The strategy which may salvage the problem may be the use of Split and Align Model of the human brain. Therefore, the study intends to investigate the effect of improvised split and align model of human brain on the academic achievement of biology students in Bosso Local Government Area of Niger State.

Instructional materials play a key role towards concretizing learning. Instructional materials make learning meaningful and help to improve students' academic achievement. However these advantages of instructional materials have not reflected in the education system because of the shortage of these instructional materials in our schools. Hence, the need for improvised instructional materials. Biology is resource intensive, and in an era of poor funding or scarcity of resources, it may be very difficult to find some of the original materials and equipment for the teaching of Biology in schools adequately, improvisation becomes the next option. Studies have shown the importance of improvisation in teaching of Biology. All these studies used conventional instructional materials, but there have not been studies specifically on the effect of improvised split and align model of human brain on the academic achievement of biology students. This study therefore, is geared towards finding out if the use of split and align model could bring a solution to the problem of poor achievement of students in biology. This study therefore deemed it necessary to look specifically into the effects of improvised split and align model of human brain on the academic achievement of biology students in Bosso Local Government Area of Niger State.

1.3 Aim and objectives of the study

The aim of the study is to determine the effect of improvised split and aligned model of human

brain on the academic achievement of biology students in Bosso Local Government Area of Niger State.

While the specific objectives to be achieved include to:

1. determine the mean achievement of students taught biology with improvised human brain and those taught with lecture method.
2. determine the gender influence on the mean achievement of students taught biology with the improvised human brain

1.4 Research Question

In order to achieve the objectives of this study, the following research questions were raised at 0.05 size level to guide the investigation:

1. What is the mean achievement score of students taught biology with improvised model of human brain and those taught with lecture method?

2. What is the mean achievement score of male and female students taught biology with improvised model of the human brain?

1.5 Research Hypotheses

The following null hypotheses were stated for the study.

1. There is no significant difference in the mean achievement score of students taught biology using improvised model of human brain and those taught without the model.

2. There is no significant difference in the mean achievement score of male and female students taught Biology with improvised model of human brain.

1.6 Significance of the Study

The findings of this study will be beneficial to science students, teachers, curriculum planners and administrators as it will enable then understand and acquaint themselves with instructional materials.

Finding from this study will help science students to be in a better position to access the usefulness or otherwise of their involvement in instructional material for biology lessons. This will go a long way to make them become more interested in instructional materials and also be able to handle and preserve the instructional materials better. In addition, this finding will enable teachers and students appreciate the usefulness of instructional materials as it concerns their performances in biology examination. It will also help them to see the need of instructional materials in their various schools as well as utilize the available instructional materials to their own advantage thereby improving their science knowledge and skills which in turn will improve their performances in any given exams. In addition also, findings from this study when implemented will help science students to learn in a safe, secure and conducive environment thereby increasing their pace of learning and confidence.

The teachers will be in a better position to justify or otherwise become interested in using the available instructional materials for teaching. The findings will also guide their subsequent steps or strategies towards enhancing better biology teaching with regard to using instructional materials. The findings will help teachers to put in their best, have confidence in their students and also make their students to become independent in learning biology, it will also make the teachers

to be well equipped in their field of study as teachers will have more experiences from using instructional materials. It will also help teachers to meet up with the world standard of teacher biology. In addition it will help teachers see the prospect benefit of instructional materials and outcome of their students performance in biology exams.

This research work will be useful as an empirical data that will assist curriculum planners to translate the idea into a workable blue print and to develop programme for its successful implementation thereby creating a widespread awareness of this research work. In addition this finding will re-affirm curriculum planners views about instructional materials.

Findings from this study will help secondary schools administrators to see the need and effect of instructional materials such as laboratories equipment, professional biology teachers for better performance of their student in general. This research work will encourage the administrators to provide fund to invest in the provision of necessary instructional materials. The information from this study will also expose to the administrators the benefit prospect and likewise the challenges of instructional materials for proper implementation. Furthermore, result from this research work will be a useful references material to other researcher who may have interest in carrying out an investigation in instructional materials.

1.7 Scope of the Study

The study is on the effects of improvised split and aligned model of human brain on the academic achievement of biology students in Bosso local government area of Niger state. The choice of the

area is because of poor achievement of students in biology in the area. The study is delimited to SS2 students in senior secondary schools in the area. The content scope of the study is human brain under nervous system, which is the most important aspect of this study. The content is found in the SS2 bilology curriculum and the students responded to the test instrument after four (4) weeks of classroom teaching experiment.

1.8 Operational Definitions of Term

Effect: This can be described as the outcome of something or someone due to the action of a person or thing which causes changes.

Improvisation: The act or art of building of model of human brain from clay material. Improvisation is a teacher-oriented activity meant to effectively carry out the

Teaching/ learning process successfully.

Brain: The control center of the central nervous system of human being located in the skull which is responsible for perception, cognition, attention, memory, emotion and action.

Model: A three dimensional simplified representation of human brain used to explain to the students the human brain structure and function. Under this model we have split and align model.

Split: Divided so as to be done or executed part at one time and part at the other time.

Align: To organize a linear arrangement which have regions of similarity

Academic Achievement: This can be referred to something accomplished, especially by special effort in an educational institution.

Achievement: the action of accomplishing something.

Instructional materials: These are educational materials that are use in the classroom to support specific teaching and learning objectives.

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter reviews literatures that are related to the work. Literature review aimed at recognizing work done by other people that are related to the present study. The review was done under the following headings: Conceptual Framework, Theoretical Framework, Empirical studies and Summary of Literature Reviewed.

2.1 Conceptual Framework

2.1.1 History of science teaching in Nigeria

In the past, science teaching is not done without much teaching aids. According to Abdullahi (1932) science teaching in most Nigerian schools before mid-1950s was a glorification of nature, in the mid-1950s, most Nigerian schools had returned to the science education but during this period, the syllabuses reflected British requirements and aspirations rather than Nigerian needs and desires. The foreign nature of the concept and most activities in science teaching seem to be beyond the experience and scope of the Nigerian students and the examination was foreign based. The mode of instruction and the emphasis was on role learning of unrelated laws, definitions and concepts, Regulative principles of science were ignored because most secondary schools lacks funds for scientist, but also an important tool of industry, medicine, agriculture and domestic comfort development. Today the national curriculum has come up with some clear expectations of what Nigerian children need to study in science at certain age with a little statutory guidance. However, the teacher is still left with decisions to make about the learning context, improvisation and teaching aids.

The teacher as a learned and experience person of the society has to use his initiatives to design and produce the required instructional aid or seek assistance from resource persons to improve classroom communication (teaching and learning). The model constructed in this project is three-dimensional which will appeal to the senses of sight and touch of the learner.

2.1.2 Importance of Science (Biology) Teaching in Schools

It is a well-known issue today that science influences man in all aspects of life including feeding, clothing, shelter, health care, communication, transportation, space exploration, as well as leisure. Ayodele,(2012) and Elechi, (2013) inferred that the most obvious effect of science has been its medical and technological applications, with the accompanying effects on health care, lifestyles, and social structures. Science also influences culture in many modern societies by playing a major role in shaping cultural world views, concepts, and thinking patterns (Abimbola, 2011).

A number of studies show that the importance of science and technology has been well recognized for bringing about social transformation and modernization. The importance of educational technology for achieving the national development goals has also been recognized. (Satyaprakasha, Sudhanshu, 2014)

All stakeholders in the education of the youths are concerned about low level of achievement in the educational pursuit with respect to the attainment of the educational objectives. Many researchers in Science education had been concerned about this downward trend and efforts to identify major factors with the aim of addressing them are being daily projected. The findings of the content analysis process revealed factors influencing the academic performance in Biology (Tom, Coetzee and Heyns, 2014). They therefore concluded that the main factor identified were biological science contents, characteristics of educators, educational strategies, resources and biological science assessment.

Throughout the World, we are going through a period of reflection on the teaching of Sciences, in order to maintain a healthy democracy. It is today's demand to teach biology with a solid understanding of the most important scientific ideas by using new methods. Certain features of teaching biology in present time are fairly general. Biological Sciences usually treated as descriptive rather than experimental, they are aligned to geography and geology rather than to physics and chemistry. The contribution of Science to the educative process is of two fold; on one hand, it is informative, involving the acquisition, within the limits of the students' ability of the knowledge necessary for full participation and enjoyment of life in the modern world. (Veselinovska, 2011)

It is important to note that science is useful in the world today. Almost all aspects of man's life are influenced by science either directly or indirectly (Eze, 2003). Man needs to be scientifically literate to exist comfortably in his environment. This informs the need for inclusion of scientific literacy in the goals of education in Nigeria (FME, 2008).

Olatoye (2002) was on the opinion that science education lays foundation for work in science related fields by giving the students necessary information about certain knowledge, skills, and attitude. Much has been said about secondary school students' poor performance in science generally and biology in particular. Okoye and Okeke (2007) noted that performance in biology has been declining over the years. Several factors have been identified by researchers as being responsible for the persistent poor performance recorded in biology especially at Senior Secondary Certificate Examinations. Usman (2003) opined that lack of qualified science teachers to be one major root cause.

There had been worldwide recognition of importance of science and thereby science education in national development and this has found a central place in the curricula of schools at all levels

(Ogbonna, 2007). According to Olasehinde and Olatoye (2014), Science education is designed to guide the world toward a scientifically literate society and this is important for an understanding of science as it offers personal fulfillments and excitements. Biology is usually regarded as the most simple to understand among all the science subjects and thus it is the one that usually attract the widest enrolment. Ofoegbu (2003) had asserted that Biology has a large student enrolment than any other science subject especially at the upper basic level of the Nigerian education. Despite the fact that Biology is the simplest to comprehend among the science subjects, the level of academic achievement is nonetheless not much different from other science subjects among the students. According to in spite of the popularity of Biology among students, the failure rate has remained very high (Akubuilo 2004).

Biology is usually one of the core subjects that participating students are expected to enroll into. The relevance of science in development of the nation cannot be over emphasized. Scholars (Ajayi, 2008), agreed that the growth of any nation to the standard of the 21st century technology should be anchored on the scientific based knowledge of her subjects.

The growth of any nation is a measure of its advancement in science. Mberekpe (2013) stimulated that Science is a major subject taught in schools all over Nigeria, and any nation that hopes to develop must not neglect the teaching of science in its schools. One of such science subjects is Biology.

Biology can be defined as the science of life (Ogunleye, 2012). It is a science subject offered in all the senior secondary schools in Nigeria, which is compulsory for both the science, and Arts oriented students. The teaching of biology is important because, it equips the students to comprehend the world around them and equips them with necessary skills to build a progressive

society. Enohuean (2015) similarly studied that biology provides a platform for teaching students the ability to apply learning of science concepts and principles in solving every day's problems.

Biology remains one of the basic sciences whose teaching and learning is universally known to be efficient and successful, if only undertaken simultaneously with the help of adequate instructional resources and facilities. Biology plays a vital role in the field of biochemistry, medicine, physiology, ecology, genetics, and molecular biology and as such, biology has been made a central focus in most human activities including being a solution to the problem of food scarcity, health, hygiene, family life, poverty eradication, management and conservation of natural resources, biotechnology, ethics, various social vices and as well lack of appropriate infrastructural materials (Chukwuneke, 2015).

Biology is one of the science subjects that senior secondary students offer in senior secondary certificate examinations in Nigeria (FRN, 2004). Interestingly, it is a popular subject among students and its popular nature among other science subjects has made it distinct choice for all students (Lawal, 2011). Biology is a very important science subject and a requirement for further studies of other science related professional courses such as medicine, agriculture, pharmacy, biotechnology, genetic engineering, etc.

Biology is the key to economic, intellectual, sociological, human resource development and wellbeing of any society. It is of importance in many ways for both individual and societal development as seen in biotechnology and genetic engineering (Chukwuneke, 2015). Based on these assertions on the importance of biology, there is need for it to be properly taught in the secondary schools to improve students' achievement in the subject.

2.1.3 Academic Achievement in Biology and its Impediments

Academic achievement refers to a successful accomplishment or Performance in particular subject area. It is indicated by grades, marks and scores of descriptive commentaries. Academic performance also refers to how Students deal with their studies and how they cope with or accomplish different tasks given to them by their teachers in a fixed time or academic year (Rothstein, 2000).

Fajola (2008), used the notion of academic self-concept in referring to Individuals' knowledge and perceptions about themselves in academic achievements, and convictions that they can successfully perform a given academic tasks at designated levels. Fajola (2008) further stated that academic self-concept represents a more past-oriented, aggregated and relatively stable judgment about one's self-perceived ability in a particular academic domain while academic self-efficacy represents a context specific and relatively future oriented judgment about one's confidence for successfully performing an upcoming subject-specific academic task.

Rothstein (2000) argues that learning is not only a product of formal schooling but also of communities, families and peers. Socio-economic and socio cultural forces can affect learning and thus school achievement. A great deal of research on the determinants of school achievement has centered on the relative effects of home-related and school-related factors. Others argued that in various studies they indicated both home and school environments have a strong influence on performance of students.

Musek (2001) stated that there are two broad groups of definitions of academic achievement. The first one could be considered more objective, because it refers to numerical scores of a student’s knowledge, which measure the degree of a student’s adaptation to schoolwork and to the

educational system. The second group is a more subjective one, as its determination of academic success in reliant upon the student's attitudes towards his academic achievement and himself, as well as by the attitudes of significant others towards his/her success and him/herself. This study focuses on the effect of students' produced improvised instructional materials on the academic achievement of students.

2.1.4 Factors Influencing Student Achievement

In contemporary Nigeria, great emphasis is being placed on science and technological development and also on achievement in examination in the sciences. As a result students are being encouraged to take up science related subjects. One subject that is paramount is biology.

Today Biology as a subject, pervades literally every field of human endeavor in relation to medicine, pharmacy, agriculture, etc., and places a fundamental role in educational advancement. Unfortunately achievement of students in biology at the end of secondary school has not improved in the past decade (Umoingang, 2009).

However, the interest of students in Biology have been related to the volume of work completed, students' task orientation and skill acquisition, students personality and self-concept, feeling of inadequacy, motivation, self-confidence, anxiety, shortage of qualified teachers (Aiken, 2006), poor facilities, equipment and instructional materials for effective teaching (Odogwu, 2014), use of traditional chalkboard and talk methods (Edwards & Knight, 2004), large students to teacher ratio (Williams, 2004), over loaded curriculum (Okebukola, 2002), poor delivery of content, etc. Research results (Ajagu, 2012) have shown that biology teachers continue to teach using the lecture method despite the recommended guided discovery/ inquiry methods. The inability of biology teachers to apply guided inquiry/ discovery approach and other modern methods of

science teaching , might be hinged on some problems which include, lack of laboratories, equipped with facilities in schools, large class size, lack of qualified teachers, and incompetency arising from the training of science teachers. In an effort to improve students' cognition and affective outcomes in biology and /or school achievement, educational psychologists and science educators have continued to search for variables (personal and environmental) that could be manipulated in favor of academic gains.

Of all the personal variables that have attracted researchers in this area of educational achievement, motivation to improvise instructional materials by students seems to be gaining more popularity and leading other variables. This study therefore, will help to know if students' improvised instructional material will improve on students' achievement in biology (Tella, 2003).

Findings revealed that academic performances in Biology in the schools under investigation were widely different in term of general scores per schools and candidates. Teachers' factors, school's factor, students' factor and parents' factor were in that order responsible for variations in academic performances in the schools. It is recommended that schools under same administrative management should be uniformly staffed and equipped by the government. Moreover, school management structure should properly integrate students welfare especially health into school planning. (Adewale, Nzewuihe and Ogunshola, 2012).

2.1.5 Resources in Teaching/learning Process

It is a truism that learning is essentially a social process and teaching is only an instrument of learning. It therefore becomes necessary that a teacher should use all types of machinery in guiding students' learning and these machineries that can be used in guiding learning are called instructional or teaching materials/aids (NERDC, 2009).

Instructional material come under resources for teaching and learning. Teaching/ learning resources are many and varied covering a range of objects, facilities, processes, locations, and human, from which teachers/ learners can obtain information to meet their teaching/ learning needs. For a biology teacher, these resources are indispensable tools in his/her hands for the achievement of the objectives of teaching.

For Nzewi and Nwosu (2009), resources in teaching process include anything or anybody to which or whom a teacher or a learner can turn for information or help. Thus, you have teaching and teaching resources .e.g. teachers, doctors, nurses; material resources .e.g. chalkboard/whiteboard, textbooks, magazines, books; reference materials .e.g. textbooks, magazines; non- printed materials .e.g. Pictures, drawings; community resources .e.g. farms, hospitals.

These resources are indispensable to good science (Biology), teaching and learning (NERDC, 2009). Instructional materials are those equipment and materials that a teacher uses to illustrate, emphasize, and explain a lesson in order to make it clearer to the students. These materials and equipment include simple familiar objects that can be locally obtained (Nzewi and Nwosu, 2009).

Ahmed (2007) opined that materials are also referred to as instructional materials. It should be noted that instructional materials are not and cannot be supplanted for the teaching process itself. However, the value or importance of teaching materials cannot be over emphasized.

For Nzewi and Nwosu (2009) the importance of resources for teaching and learning processes is to provide the teacher with the means of expanding the horizon of experience of students, thereby seeking to have a counterpart of firsthand experience. Teaching resources help to provide materials and opportunity for experiment. This ensures students participation in the lesson, which promotes effective learning (Nzewi and Nwosu, 2009).

The new science curriculum used in Nigerian schools is activity- based and emphasizes the acquisition of productive skills for life- long learning. These require creativity on the part of the teacher in sourcing for and using appropriate instructional resources for teaching and learning (NPE, 2004). There are factors or challenges militating against the process of sourcing for and using appropriate instructional resources for teaching and learning (NERDC, 2009).

This lack of interest and drive in carrying out practical activities on their (Students) own is what the use of resources should provide. (Bernard et al 2017). Without sufficient range of resources learners cannot individualize learning and in fact learning and performance becomes difficult (Orlich& Harder, 2001).

2.1.5.1 Types of Instructional Materials

Harmer (2001) maintains that instructional materials make learning process easier, which is why teacher should use it for better learning. As we are all aware of the fact that today's age is the age of science and technology, the teaching and learning programs have also been affected by it. The process of teaching and learning depends upon the different types of equipment available in the classroom (Olagunju, 2000).

The use of instructional materials in teaching Biology is very important because it provides a concrete basis for conceptual thinking, which motivates pupils to learn more (Ajala, 1997; Edessa, 2017).

There are many different types of instructional materials available these days, we have Visual aids, Audio aids and Audio-visual aids. Visual aids are the ones that appeal to the sense of vision. Examples are pictures, photos, models and charts. Audio aids involve the sense of hearing example of such aids are: radio, tape recorders, audio files and mp3. Carpenter and Olson (2012)

examined the effect of teaching new vocabularies through pictures, and their results showed that teachers and students had positive attitudes toward using pictures in teaching and that visual materials are an effective method in the vocabulary development of the learners. Students learn and perform better when they are taught with instructional materials because using instructional materials gives the students the chance to view, feel, listen and touch the material during teaching, which help to arouse the students' attention and interest on the process of teaching and learning (Nwike and Catherine 2013). The cognitive domain of learning should develop knowledge and intellectual skills. It also includes the recognition of specific facts and concepts that help to develop abilities and skills of the learners (Bulduk, 2016; Umutlu, 2017). Therefore the importance of teaching using models, charts, videos and real specimens in teaching and learning of human brain in secondary schools cannot be over emphasized considering its effect on developing the students' intellectual skills and hence promote retention and understanding the concepts more.

The clear use of learning visual aids such as posters, wall painting, flash card, pie chart, let the students remember the facts and altitudes for longer and more clearly (Brown et al, 2005).

Mavida *et al.* (1966) reiterate that the utilization of instruction materials such as visual learning aids make students participate effectively in the learning process, hence ending with quality education that enable them to suit in the current society in relation to technological changes. Audio visual aids play important role in teaching and learning process. Aids make teaching and learning process effective, aids provide knowledge in depth and detail and they bring change in class room environment (Rasul, *et al*. 2011).

Stokes (2002) discusses literature on visual elements in teaching and learning, saying it suggests positive results, but in order for visual enhancements to be used most effectively, teachers should

possess skills that include the language of imagery as well as techniques of teaching visually and that guidance in the area of visual literacy for instructors is warranted. Mathew and Alidmat (2013) concluded that aids are often viewed to be an inspiration and provide motivation in classroom instruction and that effective use of audio-visual aids substitutes monotonous learning environments. There is a great impact of audiovisual aids in the teaching-learning process, wherein students find the method of teaching very effective (Arora, 2013).

The findings of the study also identifies using real specimens and videos as the best instructional materials to be used in teaching mammalian skeletal system concepts than charts, this is due to the fact that real specimens and videos make classroom more interesting. Making a classroom interesting is a fundamental way for teacher to encourage and make students learn without forcing them. Real specimens and videos enable students to be more creative and active in learning. This agree with findings of Gambari and Zubairu (2008); Achebe (2008) and Moreno and Mayer (2000), who found that students taught with multimedia acquired better knowledge, and improved comprehension skills than other groups. Rafiu (2017) studied Dale's cone of experiences. Dale introduced the cone of experiences as a "pictorial device" for showing the progression of learning experiences from direct first hand participation to pictorial representation and on to purely abstract, symbolic expression. He arranged the learning experiences from the point of view of learners in order of increasing abstractness or decreasing concreteness. The cone indicates that real direct experience have least abstractness and maximum concreteness, followed by contrived experiences which are not very rich, concrete and direct as real life direct experience. The series followed down to verbal symbols which has the least concreteness and maximum abstractness.

2.1.5.2 Meaning and Nature of Models

Models are direct replica, image or copy of real, original or natural objects or figures. They are made in place of the original figure or object for obvious reasons and they are therefore use as such in place of the original objects, or figures. The use as describe in this unit are for teaching and learning. Naturally no model can do all that the original object or figure can do hence, in teaching and learning, it is only when the original is not available that the option of using models is considered (Olumorin, Yusuf, Ajidagba, and Jekayinfa, 2010).

The nature of a model is determined by certain guidelines that must be strictly adhered to while producing them. These guidelines are referred to as "principles and elements of production" or design as the case may be (Kovalik, 2010). The principles and elements are many but the ones that are relevant to modeling because of the peculiarity of being 3-dimentional visually are as listed on Table 1.

Table2. 1. Principles and Elements of Design for Modeling

	contents	**Description**
Elements	Colour	Colours of the model produced must be exactly the colour of the original/real objected to be modeled
	Shape	The model must take the exact shape of the original object or figure. There should be no adjustment of any form.
	Texture	It must have the rael texture. If the model is rough, on no account should the model be smooth
	Form	The model must take the physical form of the original object
Principles	Emphasis	Where specific emphasis are required in terms of dominance or focal point
	Proportion	The model must be proportionally balanced. For instance the length of the average human being's head will measure out of the body $6^{1/2}$ times hence the model must

		reflect the same way no matter how small or big it is
	Functionality	The model must serve the purpose for which it is meant.

2.1.5.3 Models for Teaching/Learning

As a result of lack of enough number of certain real objects, no –availability in the immediate environment and in situation where such objects or figures are not accessible or too large to be brought to the class for use as instructional materials, models are used in place of them (Olumorin e tal., 2010). Other reasons that account for the use of models instead of real objects for instruction are when the objects or figures are immovable or too expensive to purchase just for the purpose of instruction in class.

To successfully use model for instruction, the user (teacher) must be conversant with the general figures and components of the model. It must also be verified by a professional or expert in the area of the subject content for example, human brain model should be inspected and verified by a qualified biology teacher to ascertain its accuracy while the usability should be verified by an educational technologist. The resemblance of the model to the real object can be achieved through the adherence of the producer to the use of the basic principles elements of design and production. If all these steps are not strictly adhered to, there is the tendency to misinform the learner through the use of such model.

2.1.5.4 Construction of Models using Available Tools and Materials

Construction of model is a task that can be taken by an expert in the area of fine and applied arts. It requires several practices and adherence to the principles and use of elements of design. Also, the appropriate use of relevant tools, equipment and tools is necessary. However, for an interested individual, skills for model construction can be acquired by first having adequate observational view of the real objects to get familiar with the forms and features of the object.

A major process is also necessary to be followed. The most common practice is to employ the process of ADDIE, an acronym which mean, Analyze, Design, Develop, Implement and Evaluate. It is a generic model of Instructional System Design (ISD) which has stood the test of time. (Barbara, 2005)

2.1.5.5 Teaching Methods and Academic Achievement

Abdullahi (2007) and Ogbeba and Ogbeba (2007), were of the view that methods employed by science teachers for teaching science in schools are unsuitable. They pointed out that most science teachers put more emphasis on theoretical aspects rather than practical aspects of science and most science teachers lack mastery of their subject matter. Ayodele (2006) supported this view when he identified a major factor that lowers students' achievement in science subjects to be lack of appropriate and effective methodology of science teaching.

Ogunmade, Okediyi and Bajulaiye (2006) opined that lack of essential facilities, apparatus, resources and instruments for teaching science is another major contributing factor of poor achievement of students in science. Some of these include lack of teachers, lack of educational amenities like laboratories, poor attitude and lack of interest on the part of the students, laziness,

large class size/ high teacher student ratio, poor teaching methods by teachers, loaded syllabuses, and family background of the students (Uzunboylu, Bicen &Vehapi, 2017).

Ajayi and Ayodele (2001) stressed the importance of availability of instructional materials to achieving effectiveness in educational delivery and supervision in the school system. Ogbondah (2008) alerted on the gross inadequacy and underutilization of instructional materials necessary to compensate for the inadequacies of sense organs and to reinforce the capacity of dominant organs. He noted that school teachers should try their possible best in the provision of locally made materials in substitution for the standard ones to promote their lessons. Enaigbe (2009) noted that basic materials such as textbooks, chalkboard and essential equipment like computer, projector, television and video are not readily available in many schools.

Akinleye (2010) attested that effective teaching and learning requires a teacher to teach the students with instructional materials and use practical activities to make learning more vivid, logical, realistic and pragmatic. Esu, Enukoha and Umoren (2004) agreed that instructional materials are indispensable to the effective teaching and learning activities. Ekpo (2004) also supported that teaching aids are always useful in supporting the sense organs. Despite the fact that instructional materials are essential tools that can make learning practical and knowledge acquisition easier, they are not readily available in Nigerian secondary schools leading to low level of performance of learners in government examinations (Abdu-Raheem 2014).

2.1.5.6 Factors that affect the use of Instructional Resources

Teachers have been found to have difficulties in selecting and using instructional materials for teaching. Part of the difficulties has been that teachers tend to teach the way they were taught in

their training (NERCD, 2009). Consequently, teachers use the materials they were exposed to during their training. This habit is often difficult for teachers to change.

Other reasons advanced for the inability of teachers to use instructional resources effectively include:

• Inability to identify/ locate resources;

• Inability to develop appropriate materials from local resources;

• Lack of school- based resource Centre; and

• For instructional materials development, selection and utilization and Lack of short term training to update teachers' knowledge and skill for instructional materials development, selection and utilization (NERDC, 2009).

In line with the stated reasons, the biology laboratories are to be equipped appropriately to make teaching and learning conducive. According to Nwakonobi and Igboabuchi (2010), biology laboratories are places where different types of experiments and researches concerning all disciplines of life sciences take place for skills acquisition.

However, these skills cannot be acquired in the absence of well-equipped biology laboratories to enhance effective teaching and learning which is geared towards empowering the students to become functionally and qualitatively, educated, productive, self-reliant, and sufficient and create enabling environment. All these are aimed at devising a proper opportunity to salvage the medium of instruction in the national educational system. It is against this background that the researcher decided to investigate the effect of students' produced- improvised instructional materials on the

academic achievement of secondary schools students in biology examination (Nzewi and Nwosu, 2009).

On the question of the adequacy level of biology teaching and learning resources in their schools, majority (80%) of the head teachers said they had inadequate resources while twenty per cent said they had adequate resources in their schools. It is instructive to note that the few (20%) head teachers who indicated they had adequate resources were from four provincial schools that are deemed to have sufficient resources according to list of schools from the DEO office. Enough or scarce, the utilization aspect of the teaching and learning resources is what determines whether learning objectives can be realized, taking into account what we want our students to know (Bernard et al 2017). When asked to comment on resource utilization in their schools, many (60%) head teachers said that the available resources are not utilized to the maximum. Quarter (25%) said they were moderately utilized while minority (15%) said they were utilized to the maximum. Most of the principals felt that the available resources are not being used to the maximum. They demonstrated the relationship between utilization of resources and academic performance is that availability and proper utilization of teaching and learning resources improves academic performance.

Mboto et al (2011) demonstrated the low achievement trend in the sciences to non-availability of instructional materials in schools, thus the need for improvisation.

Ubana (2009) stated that scientific concepts are retained better and learning tend to become more meaningful and interesting when learning materials are used. Dogara and Ahmadu (2000) defined learning materials as anything that helps to bring about success in the classroom.

The findings of this study is in agreement with the findings of Orji (2000) that obtained a result in which the experimental group performed better than the control group in the retention test. The improvised material thus seemed to make students to remember conceptual ideas more than no material.

2.1.6 Improvisation and Skills for Improvisation

Generally, improvisation of instructional materials in science teaching particularly biology is an attempt to adapt and make use of local resources in the teaching/ learning process when the readymade materials are not available or are in short fall or not within the reach of the users. The improvised instructional materials could be produced by the teacher and the students.

According to Fajola (2008), improvisation in the context of biology can be defined as a process of using alternative resources for enhancing biology teaching in the absence or shortage of the real ones. The production of the alternative resources is initiated by the teacher and done either by him or the local craftsmen (e.g. the Carpenter, blacksmiths, wielder, etc).

The teacher may also use the students for improvising some of the needed materials or equipment. Improvisation in the view of Aremu, Mberekpe (2013) examined a technique of originating a totally new tool, instrument, materials, device or modifying existing ones for serving a particular purpose. Ahmed (2010) sees improvisation as the process of making equipment and materials by the teacher or by engaging the services of others in the absence of the real or manufactured ones.

Wasagu (2000), described improvisation as the act of using alternative 26 materials and resources to facilitate instruction whenever there is a lack of or shortage of some specific first hand teaching aid. When students are involved in the production of improvised instructional materials through

their creative ability and imagination, it gives new concept of things outside the range of ordinary experience to the students and makes learning last longer in their memory.

For a student to be able to improvise, he/she must be innovative, resourceful and creative in both thinking and manipulative skills (Igwe, 2003). Fajola (2008) looked at improvisation from the level of creativity involved. These levels involve substitution and construction. Substitution in improvisation simply implies the techniques whereby a local material is used in place of a piece of equipment that is not available whereas construction involves making of a new instrument in place of the unavailable original one where substitution is not possible.

It is expected that both substitution and construction of improvised instructional materials will meet the demand for the real or original material with as high precision as time, money and other facilities and factors will permit. According to Ehikioya (2000), the major reason for improvisation stems from the fact that educational funding is insufficient and in the recent years seriously dwindling. Educational authorities find it increasingly difficult to provide the schools with all they need for teaching and learning.

Ahmed (2010), claimed that instructional resources ensure that the learners see, hear, feel, recognize and appreciate as they learn, utilizing almost all the five senses at the same time. Olagunjo (2000), however, asserted that improvisation provides a cognitive ‘bridge’ between students abstract and real experience of teaching and learning.

According to Olagunjo (2008), when a teacher improvises, it enables him to re-think and research for cheaper, better, and faster methods of making the learning process easy and safe for both the students and the teachers. Abolade (2004), maintained that improvisation of instructional

materials provide direct experience with reality as well as encourage active participation and acquisition of skills especially where students are allowed to manipulate the materials.

According to Abolade (2004), the attainment of affective and psychomotor domains is increased by improvisation. When students are motivated by their teacher to produce or source their own instructional materials, it greatly arouses the students' interest to learning and development of scientific attitude. Improvisation, therefore, enables students to exhibit their latent potentialities, improve their creativity and as well discover new things. Etukudo (2000) was of the view that improvisation of instructional materials involves diversifying and learning experientially which require versatility and flexibility of experience on the part of the teacher.

Etukudo (2000) reported that the use of improvised instructional materials make the teaching/ learning process a result oriented exercise, and enhances students' achievement. Olagungu (2000), however, discovered that the use of improvised concrete instructional materials for instructional process enhances visual imagery, stimulate and as well scintillate the learning, thereby creating room for higher concentration and individualized approach to concept mastery. This could have been responsible for gender blending in the achievement of the students in Mathematics. Olagungu (2000) deduced that the use of improvised instructional materials in the teaching/ learning process enhances higher achievement as well as induces gender parity in mathematics achievement. Similarly, Mbajiorgu (2003) found that improvised instructional materials bridged the attendant achievement gap between male and female students in sciences.

In biology teaching and learning, the use of improvisation in teaching is advocated as a substitute when the standardized materials are not available. This is to promote learning by doing and skill acquisition for further use and for achievement of self-reliance of students in certificate

examinations. Self-reliance involves optimal utilization of local materials with 28 well coordination of sustainable development (Etuibon&Udofia, 2009).

In other to teach by inquiry method or activity based oriented form of instruction, improvisation is inevitable. The instructional materials at the secondary school level are not adequate (Okebukola, 2002, Ikwuanusi, 2007). There is need for improvisation of non-available instructional materials for students to get first-hand information and acquire the scientific skills as the objective stipulated.

2.1.7 Human brain; Structure and Functions

The average adult brain weighs about 3 pounds (1300-1400 grams). Like snowflakes, no two human brains are exactly alike, although they do have common structures and configurations. Brain size doesn't equal intelligence. Someone with a five-pound brain would not necessarily be "smarter" than a person with a two-and- a- half-pound brain. Albert Einstein had a smaller than average brain, for instance. It's more a matter of circuits that brain cells operate. An elephant has a fifteen-pound brain, but few elephants have made significant scientific discoveries. The brain is made up of many different structures. Like the Earth, the cerebrum (top part of the brain) is divided in two hemispheres. The word 'hemisphere' means 'half of a circle' in Latin. There are many interesting things to learn about the cerebral hemispheres. The left hemisphere controls the right side of the body, and the right hemisphere controls the left side of the body. While the hemispheres are similar in appearance, they are not identical and have different functions.

In most people, the left hemisphere is dominant for language, speech, writing, math, and logical reasoning. The right hemisphere is dominant for music, spatial awareness, art, intuitive thought, and imagination. A bridge-shaped band of nerve fibers called the corpus callosum (which means 'body of hardness' in Latin) connects the two hemispheres. There are millions of nerve fibers in the adult human corpus callosum that send messages back and forth between the hemispheres. The

nerve fibers in the corpus callosum allow the hemispheres to communicate with each other. Since the two hemispheres have different and complementary functions, it is important for them to communicate for optimal mental performance. The cerebral hemispheres are covered by tissue called the cortex, which controls movement, sensory processing, and thinking. The cortex (meaning 'bark' in Latin) is only about 2-3 mm thick. The 'wrinkles' on the cortex are called gyri (pronounced jie-rye), which is Latin for 'roll' or 'fold'. One such roll is called a gyrus. The grooves between the gyri are called sulci (pronounced sul-sigh). This is the Latin term for furrow, like the lines in a farmer's field. The singular form of sulci is sulcus. The surface of the brain is folded so that more tissue can fit inside the skull. If the cortex were ironed flat, it would be about the size of a pillowcase. Three main parts of the human brain for example; the forebrain, midbrain and hindbrain.

The forebrain- is dominated by the cerebral hemispheres but it is also the region where the thalamus and hypothalamus are found. **The hypothalamus**- although relatively small, is one of the most interesting parts of the brain because it has so many functions. It is located just below the thalamus (hence its name), and it is subdivided into at least a dozen of separated areas each with its own function. **Hypothalamus Functions** in regulation of body temperature and the body's urges such as thirst and hunger by impulses it sends along the autonomic nervous system and Controls of endocrine secretions by monitoring the metabolites and hormone levels in the blood. **The thalamus**- on the other hands is two ovoid structures attached to the back of the forebrain. **Thalamus Functions** in receiving sensory information from various parts of the nervous system, integrating it and passing it onto the relevant regions of the cerebral cortex and coordinating outgoing motor impulse from the cortex.

The midbrain-this region connects the forebrain with the hindbrain. **Midbrain** helps control the reflex movements of the eye muscles, head, neck and trunk in response to visual and auditory stimuli, as well as changes in pupil size and lens shape of the eye.

The hindbrain-the structure that looks like a little brain underneath the hemispheres is called the cerebellum. The cerebellum helps to coordinate movement, balance (gyroscope), and thinking. Appropriately enough, cerebellum means 'little brain in Latin. In front of the cerebellum is the brain stem. The brain stem is a collection of different structures that connects the brain to the spinal cord. The brain stem is kind of the 'automatic pilot of the brain. It helps regulate the autonomic nervous system, controlling functions like breathing, heartbeat, blinking, blood pressure, and the pupillary reflex.

Pons-The pons is a relay station between the cerebellum, spinal cord and rest of the brain (pons means **bridge**). **Medulla oblongata** is one of the best protected parts of the brain and one of the most vital. It is at the posterior end of the brain that continues into the spinal cord. It has an outer region of white matter and an inner region of grey matter. **Medulla oblongata** helps to control many involuntary movements of the body, especially those concerned with respiration, heart beat and digestion and it also controls constriction and dilation of the blood vessels (thus regulating blood pressure).

2.1.8 Gender in Science Education

Gender has been described as a cultural construct and social position which members of

the society attach to being male or female. Gender also means a dimension of social organization

which shapes how people interact with others and how people behave or act and think about

themselves. It also includes the hierarchy and ranking of men and women distinctly in terms of power, wealth, privilege and other resources. According to Okeke (2007), gender is a social or cultural determinant that varies from place to place or culture to culture. It is not universal, unlike sex which is biologically determined and universal. Macionis and Genber (2005) observed that throughout life (birth and death), human feelings, thoughts, and actions reflect the social definitions that people attach to gender which affects the way the individual's daily activities may either be positively or negatively influenced. As gender affects the way people think of themselves, it teaches them to act in normative ways, that is acting and feeling in the manner that the society ascribed to each sex. Connell (2003) maintained that as much as culture defines males as ambitious and competitive and females' differential and emotional, males are expected to aspire to leadership positions while females are expected to be good listeners and supportive observers. This gender role discrimination begins from the family and is later extended to other areas of one's life where a man sees himself as superior in every human endeavours and sees a woman in a subordinate position in the educational setting, workplace or other parts of life. In other words, gender is a fundamental category for ranking and classifying social relations in the world (Evans, 1994) as cited in Banjon (2015).

In an educational setting, for instance, experience has shown that the curriculum, textbooks and the teaching materials tend to favour males and the females' intellectual potentials are

ignored. This gender distinction manifests itself in the courses offered by males and females in the school, for example, males are represented in mathematics, science, and technology while females are grouped into humanities, education and social science courses (Gaidzanwa, 1990; Cottes, 2003). In the new areas of study such as computer science with its grounding in engineering, logic, and mathematics, males mostly enroll in it while females mostly enroll in gender studies (Macionis & Genber, 2005).

The word gender does not mean that there is a clear difference between females and males in terms of preferences for arts, science, and technology. If there are differences, they are based on hierarchical structures within the culture of what is suitable for males and females respectively (Walkerdine, 1997) as cited in Banjon (2015). According to Kembler (1996) as cited in Banjon (2015), science and information and communication technology (ICT) is in no manner separated from the cultural structures that treat women and girls unfairly or unequally compared to the men counterparts. Males and females are supposed to be allowed and encouraged to study science and technology, arts, and humanities because there is no course that is made specifically for each sex. Science and technology courses are not for males alone; females are to be encouraged and motivated to offer science and technology because of its importance in this era of globalization and computer age Nwosu (2001). Recently gender-related issues in science education have continued to receive serious attention judging by the number of studies done to that effect. For example Babajide (2010) reported that science subjects such as physics and chemistry are given a masculine outlook by educational practitioners. In addition to this, the studies by Ogunleye (2002); Zirim (2006); Okwo and Otubar (2007) indicated that science achievement depends on gender.

Also the studies by Nzewi (2010); Ogunleye and Babajide (2011); posited that gender is insignificant in science achievement. Oludipe (2012) also opined that promoting achievement in students' understanding of science does not depend on gender rather it is through the determination of the students. Agomuoh (2010); Ukozor (2011) found that gender influences students' conceptual shift in favour of the male.

Harlen (1998) attributed gender inequality in science teaching methods used by science teachers that creates a wider gap in achievement. This statement has been supported by Agomouh (2010). Studies by Madu (2004); Agomouh (2010) have shown that student's achievement is gender-dependent using a constructivist based instructional method.

Considering the findings of different people above, it is clear that there is not yet a consensus as to whether gender influences science achievement or not. Some are of the opinion that males are superior to females, while others said it is females and some are even neutral.

Based on these controversies, this study will further investigate the influence of gender using

effects of improvised split and aligned model of human brain on the academic achievement of biology students in Bosso local government area of Niger state.

2.2 Theoretical Framework

2.2.1 Jerome Bruner's Learning Theory

Bruner (1960), introduced the concept of learning by discovery. Bruner is of the view that learning is effectively engaged in if the learner is giving the opportunity to discover facts by him/herself. Bruner argues that mere presentation of information will not enhance effective solution of a problem. The theory stresses cognitive effectiveness. Because of this, some referred to Bruner's

theory of learning as Bruner's theory of cognitive development. Bruner believed that learning by discovery begins when science teacher purposefully (i.e. intentionally) create (present) a problem and present it to the students by introducing some inconsistencies (i.e. contradictions) among source of information which are giving in the process of instruction.

According to Bruner, such inconsistencies lead to intellectual discomfort that will stimulate (i.e. motivate) the students to initiate individual discoveries through cognitive restructuring (i.e. internal reorganization). The intellectual discomfort created by the inconsistencies makes the learner to attempt to bring order out of this confusion by engaging in mental processes i.e. discovery activities which involve observation, hypothesizing, measuring, stating problem, data collection, classifying, inferring, etc. (Montoya, 2015). Through mental processes, the student can generate facts from his/her desperate experiences. Experiences gained during the mental processes enable the students to sense the disparity. According to Bruner there are two forms of discovery processes which are:

1. **Assimilation:** This occurs when a student recognizes a new situation that is familiar to one of the elements in the existing structure of knowledge (i.e. cognitive structure) and he/she easily assimilates it.

2. **Accommodation:** This occurs when a new situation (i.e. a new knowledge) is incompatible to the existing structure of knowledge (i.e. cognitive structure) the learner first restructures (i.e. reorganizes) his/her cognitive framework (i.e. cognitive structure) in order to be able to accommodate the new knowledge. Bruner believes that the students should find out information on their own using mental processes. The theory places great emphasis on the three types of human activity for learning i.e. the three information processing systems which are:

• Physical activity (motor activities) called Enactive representation.

• Imagery called Ionic representation.

• Symbolic activities

The three activities coexist with each other and for this reason; the attainment of one does not mean the total abandonment of the others. At enactive stage, the child manipulates the learning materials directly by neuro muscular activities. At ionic stage, the child deals with mental images of objects, but does not manipulate them directly.

At symbolic stage the child uses language. The interpretation of the above is that when a child, say at secondary school level shows deficiencies in his/her learning capacity especially in symbolic representation, it could be that he/she was deficient in early stages (i.e. enactive and ionic stages) which he/she skipped.

It is therefore necessary to fill in the missing gap by providing concrete support that will make up for the deficiency. Discovery learning, when encouraged in science instruction also aids problem solving because learning by discovery starts with problem solving (Enohuean, 2015). Discovery learning also stimulates creativity in the student, which is one of the major objectives of science teaching/learning.

2.2.2 Application of Jerome Bruner's Theory of Learning to Biology Teaching/Learning:

The biology teacher should intentionally create or present problems to students either in form of apparent contradiction or inconsistency among sources of information which are giving in the process of instruction. Encouraging discovery learning in biology class by biology teachers will result into aiding problem solving. One of the major objectives of biology teaching is creativity.

Therefore, discovery learning encourages creativity. Students should be taught concepts in such a way that they have applicability beyond the situation in which they were learned. Retention of science concepts are aided by knowledge acquired through discovery learning. Teachers must encourage students to make intuitive guess more systematically.

Bruner supported a radical reorganization of the curriculum across all levels of education. Bruner advocated the fundamental structure of curriculum to begin with simple contents and later graduated to complex contents. That means that learning should proceed from simple to complex, from concrete to abstract, and from specific to general. Teaching should be inductive. Bruner supported the spiral nature of curriculum as we have in our present science curriculum at all levels of education.

Bruner's Constructivist Theory asserts that learning is an active process in which learners construct new ideas based upon their current knowledge. Instruction can be made more efficient by providing a careful sequencing of materials to allow learners to build upon what they already know and go beyond the information they have been given to discover the key principles by themselves.

In relation to the present study: Effects of Improvised Split and Align Model of Human Brain on the Academic Achievement of Biology Students in Bosso Local Government area of Niger State, the application of Bruner's constructivist theory to learning will help the students to have a focused attention on the principles they learn and also increase and sustain students' attitude to learning environment.

Secondly, Bruner's theory of learning by discovery and his theory of cognitive development suggested that instructions at all level should be geared towards the learning maturational

development or cognitive operation. Bruner's theory is directly related to the present study: effect of students' produced improvised instructional materials. This is because effective use of students' produced improvised materials involves the learner actively working on his own to find solutions to problems. So, Bruner's theory is in support of the present study (Montoya, 2015).

2.2.3 Piaget's Theory of learning

Jean Piaget's (2001) cognitive theory.

Piaget's cognitive theory of learning refers to the stage theory of cognitive development.

According to Piaget, children develop knowledge by inventing or constructing reality out of experience and thus mix their observation with their ideas about how the world works. Piaget observed that people of the same age level (especially children) have a similar line of reasoning. For instance, children of the same age level have similar line of reasoning or thinking. Children may make the same type of mistakes.

They may have the same reasoning process. This indicates that cognition develops stage by stage. Piaget used the terms 'Assimilation' and 'Accommodation' to explain his views. Assimilation: Assimilation means a process of interpreting actions or events in relation to one's schemas. This refers to a means of fitting reality into one's existing structures of knowledge. The term 'schemas', for Piaget, refers to a well-defined sequence of physical and mental actions.

Accommodation: This is the modification of existing schemas to fit reality. The organism is capable of learning when it can modify its schemas. As the organism continues to accommodate, it continues to learn. Piaget believes that cognition develops from age to age and from level to level. According to Piaget, the driving force for cognitive development is equilibration.

By equilibration, Piaget means balancing assimilation and accommodation to adapt to the demands of the environment. Piaget believes that for people to learn, they must assimilate and accommodate. Piaget opined that at each stage of development, people use a distinctive underlying logic or structure of reasoning to guide their thinking.

Piaget identified four stages of cognitive development – sensor motor, pre-operational, concrete operational and formal operational to explain cognitive development from infancy to adolescence (Wasagu, 2011). However, we should be concerned with the 'formal operational stage'. This stage occurs within the adolescence stage. At this stage, the young individual can start to think more abstractly. This stage of cognitive learning is characterized by ability to manipulate abstract as well as concrete objects, ideas, and events.

At formal operational stage, the young individual acquires more ability to deal with abstractions and may engage in hypothetical reasoning based on logic. At the adolescence stage, individuals can easily carry out practical experiments and demonstrations. Formal operational stage offers the ability for the individual to use abstract symbols for representational purposes.

For instance, the individual, if taught, could understand that H_2O is water and may abstractly understand why it represents water. Piaget's theory of intellectual development holds that cognitive development takes place from active interaction of the child with his environment. This means that the basis of learning is the child's own ability as he interacts with his physical and social environment. Piaget is of the opinion that a child must act on the objects in his environment for him to learn.

This means that he should be actively involved not be passive. The active involvement of the child may be in form of direct manipulation, visual observation or through mental or internal

transportation or change. Piaget believed that mental activity, which is involved in cognitive organization, is a process of adaptation, which is divided into two opposing but inseparable processes of assimilation and accommodation.

Accommodation means to modify self to fit the new materials, while assimilation means to modify the materials to fit the self. The Piagetian theory places the child as the principal agent in the teaching/ learning situation. This being the case, the teacher's job is to provide the individual with situations that encourage experimentation and manipulation of objects and symbols.

The theory has direct implication on the researcher's study: effect of students' produced improvised instructional materials on academic achievement of students in Biology. In the first place, the Piagetian theory of intellectual development holds that cognitive development takes place from active interaction of the child with his environment.

This is why the researcher advocates the use of students' produced improvised instructional materials, because it is a student- centered, activity oriented- teaching strategy in which the teacher acts as a facilitator of learning, guiding the students through a series of activities and problems, which will enhance achievement by learners (Oyediran, 2010).

Assimilation: According to Jean Piaget, this involve the use of an existing schema (building blocks of knowledge) to deal with a new objects or situation.

Equilibration: This can be referred to the force that drives the learning process

2.2.4 Sir Fredericks Theory of Cognitive-Information Processing Learning

Sir Fredericks introduced the theory of Cognitive-Information Processing in 1932. No single point in time signaled the end to the associationistic or behavioral era, and the beginning of the cognitive

revolution. Early on, the cognitive revolution was a quiet one. Another prominent factor was the development of computers (Baars, 1986), which provided both a credible metaphor for human information processing, and a significant tool for modeling and exploring human cognitive processes.

One major group of cognitive theories may be classified as cognitive-information processing learning theories. According to the cognitive information processing (CIP) view, the human learner is conceived to be a processor of information, in much the same way a computer is. When learning occurs, information is input from the environment, processed and stored in memory, and output in the form of a learned capability. Proponents of the CIP model, like behaviorists, seek to explain how the environment modifies human behavior. However, unlike behaviorists, they assume an intervening variable between the environment and behavior. That variable is the information processing system of the learner. Most models of information processing can be traced to Atkinson and Shiffrin (1968) who proposed a multistage theory of memory in which information received by the processing system undergoes a series of transformations before it can be permanently stored in memory. This flow of information, as it is generally conceived, is depicted in Figure 2.1. Displayed in the figure are three basic components of memory (i.e., sensory memory, short-term memory, and long-term memory) along with the processes assumed to be responsible for transferring information from one stage to the next. This system provides the basic framework all learning theories classified under the cognitive-information processing category.

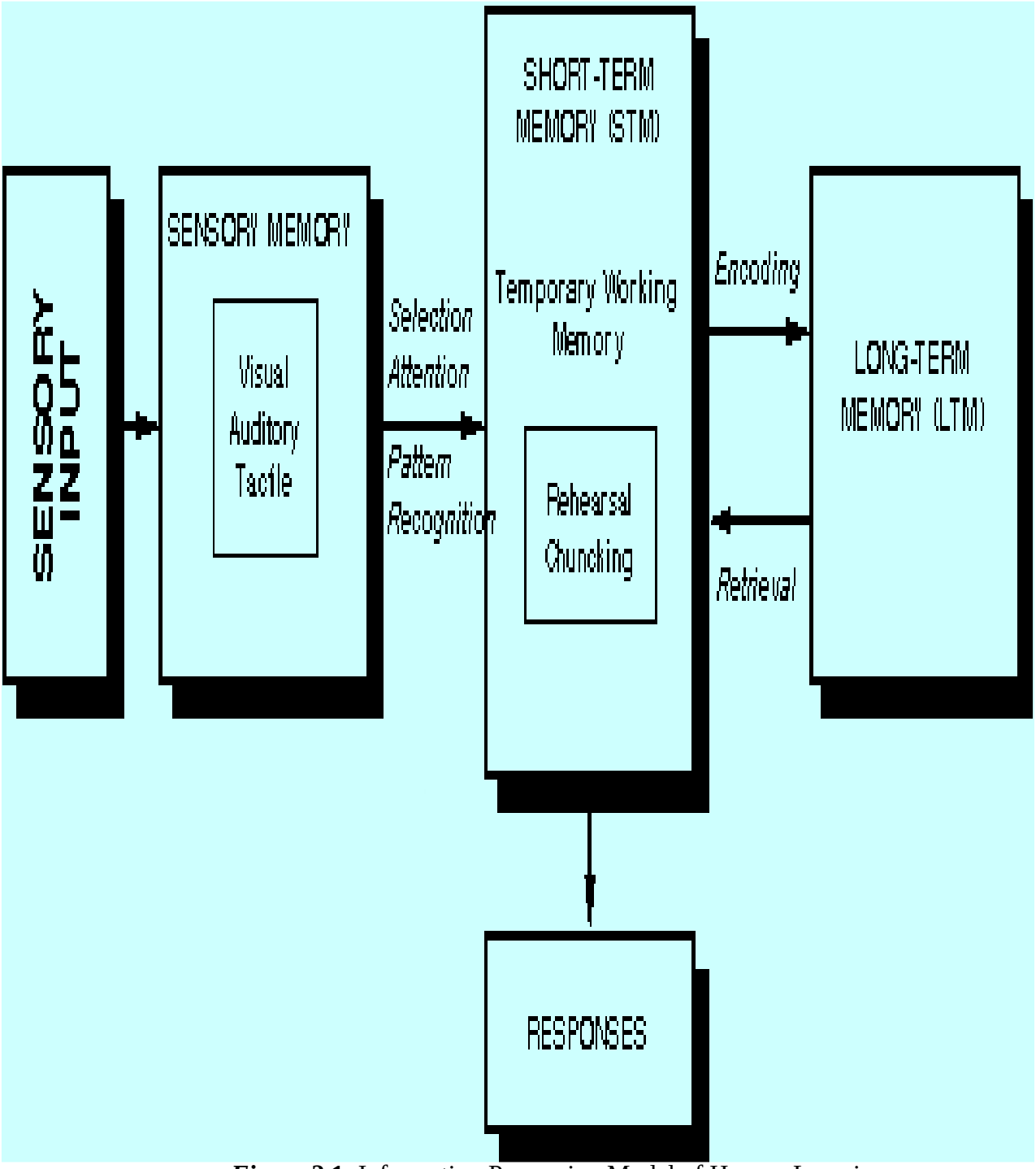

***Figure* 2.1**: Information Processing Model of Human Learning

The following is a brief summary of each major component of the information-processing system and their implications for instruction.

Memory Sensory

Sensory memory represents the first stage of information processing. Associated with the senses (vision, hearing, etc.), it functions to hold information in memory very briefly, just long enough for the information to be further processed. It is believed that there is a separate sensory memory corresponding to each of the five senses, but all are assumed to operate in the same way.

- **Selection Attention**

Selective attention refers to the learners' ability to select and process certain information while simultaneously ignoring other information. The degree to which an individual can spread their attention across two or more tasks (or sources of information) or focus on selected information within a single task depends on four factors:

1. The meaning of the task or information to the individual
2. The similarity between competing tasks or sources of information
3. Task complexity or difficulty
4. Pattern Recognition

Just attending to information is not enough to ensure its further processing. Attention is believed to be necessary but not sufficient; information must be analyzed, and familiar patterns must be identified to provide a basis for further processing. Pattern recognition refers to the process whereby environmental stimuli are recognized as exemplars of concepts and principles already in sensory memory.

Short-Term Memory

Short-Term Memory (STM) functions as a temporary working memory where further processing is carried out to make information ready for long term storage or a response. At this stage, concepts from long-term memory (LTM) are also activated for making sense of the incoming information. STM or working memory has been likened to consciousness. When we actively think about ideas and are therefore conscious of them, they are said to be in working memory. STM, however, only holds a certain amount of information for a limited amount of time.

- **Rehearsal & Chunking**

Rehearsal and chunking are two processes that may help individuals encode information into long-term memory. When you repeat a phone number to yourself over and over again, you are engaged in rehearsal. Chunking is the grouping of ideas, letters, phrases, etc. into bits of information to facilitate the encoding process. Take for example, the following long word: dichlorodiphenyltrichloroethane. As individual word, it is more likely to exceed the capacity of working memory. However, as four chunks--dichloro, diphenyl, Trichloro and ethane are easily processed. Encoding refers to the process of relating incoming information to concepts and ideas already in long-term memory in such a way that the new material is more memorable. Encoding serves to move information from STM to LTM. There are too many studies and methods for facilitating encoding to review here in any meaningful way. In short, it is believed that individuals impose their own subjective organization to materials in order to learn them. However, techniques such as outlining, hierarchies, concept trees, mnemonics, mediation and imagery have all been shown to aid the encoding process.

Long-Term Memory

Long-term memory (LTM) represents our permanent storehouse of information. Anything that is to be remembered for a long time must be transferred from STM to LTM. Although forgetting is a phenomenon we have all experienced, it is assumed that once information has been processed into LTM, it is never truly lost. As far as we know, LTM is capable of retaining an unlimited amount and variety of information. It has limitations in our retrieval process that are believed to constrain our ability to remember. There are a number of different views of how information is stored in LTM including, but not limited to, schemas and mental models.

- **Retrieval**

The process of retrieval from long-term memory is relatively simple to understand. Previously learned information is brought back to mind, either for the purposes of understanding some new input or for making a response. Using previous knowledge to understand and learn new material has already been discussed as encoding. Using previous knowledge to make a response is known as retrieval. There are a number of alternative cognitive theories, including, but are not limited to: Levels or Depth of Processing, Meaningful Learning, Schema Theory, and Mental Models. These all relate learning with information processing, which is why they are grouped here. However, they do not necessary adhere to the CIP model as the method used by individuals to process information, or they focus on only one or a few components of the CIP model. In relation to the present study: effects of improvised instructional human brain model on students achievement in Biology among senior secondary schools, the application of Sir Fredericks cognitive-information processing theory of learning will assist the students to have a focused and undivided attention on the concept they learn. **Secondly,** Sir Frederick's learning theory suggested that any information received by the students should be subjected into constant rehearsal to perfect their achievement on the concept

Thirdly, Sir Fredericks learning theory if backed with appropriate instructional materials will aroused and sustained learners interest hence the proper use of their sense organs. Sir Fredericks theory of learning is directly a match to the present study; Effects of Improvised Split and Align Model of Human Brain on the Academic Achievement Of Biology Students in Bosso Local Government area of Niger State. This is because effective utilization of improvised model will enhance cognitive-information processing of the learner which will result into student's achievement of the concept. So, Sir Frederick theory is in support of the present study.

2.3 Empirical Framework

2.3.1 Effect of Instructional Materials on teaching and learning (Sciences)

Elizabeth Wambui (2013) in kenya reported the importance of grouping of learners on participation in science classroom and study the extent to which availability and adequacy improve learners' participation and to determine the effect of management of records on the improvement in learners' participation in science classroom. The study reviewed literature on effectiveness of instructional materials on participation in science classroom. This study was guided by experiential learning theory.

This theory was propounded by Kolb (2008). Kolb proposed a four-stage learning process with a model that is often referred to in describing experiential learning Beatty (2009). The study involved a descriptive survey research design where qualitative data was collected. The design was non-experimental soliciting information from teachers on the Instructional Materials they use in teaching students in the pre-school. This study used stratified sampling since the population embraces a number of distinct categories of teachers' qualifications. The study found that instructional materials are not effectively used in the study area due to large number of learners per class, lack of enough compounds in early child Education centers, lack of learners' confidence,

language barrier, teachers' negative attitude, lack of professional skills and domestic violence. She recommended that early child education centers be increased to cater for the large number of learners per class. On the same study she recommended that more teachers be employed and deployed to various early child education centers in the study area. The study further recommended that more playing ground be purchased to enable learners be participating fully especially while experiencing moving air by the use of kites they need to run over to note the moving air. Learners should be encouraged to handle Instructional materials even in the absence of teacher that is at home to gain confidence. Parents of the learners who are shy should be improvising Instructional materials at home and encourage children to continue practicing what they learnt at school.

The study also recommended that teachers to ensure learners with language barrier get information taught in class by the use of language they understand better as English and Kiswahili is introduced slowly by slowly. The study further recommended that Government of Kenya to employ Early child education teachers with better pay. Finally the study recommended that the 5 untrained teachers and those with certificates work on the professional skills by going for Diploma course in Early child education as lack of these skills deny any teacher the knowledge required in showing and teaching learners on how to handle Instructional materials during participation.

Nwike (2013) showed that the use of instructional materials in teaching in secondary schools have a positive impact on student academic performance. By using the quasi experimental design in the experiment to find out the effects of use of instructional material on students cognitive achievement in agricultural science in secondary schools of Orumba South Local Government Area and a sample comprising of 256 JS II students randomly sampled from 5 schools drawn from 5 towns in the local Government Area. The students were divided into two groups (experimental

and control, group). An Agricultural Achievement Test (AAT) of reliability 0.82 was used for the study. The experimental group was taught using instructional materials while the control group was taught without instructional materials. Data collected was analyzed using mean, standard deviation and z-test statistics. The findings revealed that students taught with instructional materials performed better than those taught without instructional materials. Also there is no significant difference in the mean achievement scores of male and female students. The null hypothesis tested at 0.05 level of significance indicated that there is significant difference between the achievement scores of those taught with instructional materials and those taught without instructional materials.

2.3.2 Academic performance in Secondary schools

Awolaju (2016) carried out a study investigating how instructional materials as correlates of students' academic performance in Senior Secondary Schools in Osun State. The sample used for the study consisted of 40 students who were randomly selected from two different secondary schools in Ilesa East Local Government area in Osun State. 20 Students were used for experimental group while the other 20 students were under the control group. Quantitative method was used to collect data by using the research questions and hypotheses formulated for the study. Research instrument used for the study consisted of Biology Achievement Test (BAT). This BAT contained a 50 multiple choice items. A reliability coefficient of 0.82 was obtained for the BAT, using Test-retest method. Data collected were analyzed by using mean score, standard deviation and *T*-test distribution. After carrying out the experiment; it was revealed that students taught with instructional materials performed better than those taught without instructional materials. That is the experimental group performed better than the control group. It was further revealed that there is no significant difference between pre-test scores and post- test scores of experimental group.

The post test scores of male and female students taught with instructional materials showed no significant difference between their scores. Based on these findings appropriate recommendations were made.

2.3.3 Use of Visual Aid on Students achievement

Kaswa (2015) investigated the effect of visual learning aids on student academic performance in secondary schools in the study area of magu district. Using a sample size of 102 people, examined the performance of four schools of Magu in the 2013 and 2014 National Form Four Examinations in which two schools used visual learning aids and two schools were not using. The study inquired also about the kind of aids used and their quality. The study also examined the factors that made some schools use the aids and the barriers in other schools, and lastly, the study inquired about other barriers that inhibited performance in public secondary schools in the District. Questionnaires, documentary reviews and cross-examination interviews were used to collect data. The outcomes were that Magu and Kitumba Secondary Schools which used learning aids had better results for the consecutive years of 2013 and 2014. District wise, Magu and Kitumba Secondary Schools held the position of 8th and 7th and Ktumba held 10th and 3rd positions in the two years. Kandawe held 16th and 17th and Itumbili held 10th and 14th positions out of 19 schools in the same years. There were however other factors that affected the performance of students in the District which include; shortage of teachers, poverty of parents, lack of books and lack of laboratories.

Michelle (2013) investigated the effects of visual media on the achievement and attitude in biology classroom in secondary schools in the state of Ohio, USA. In this study at a rural high school sophomore biology students were shown short, informational video clips, in addition to direct instruction, to determine if there was an effect on achievement and/or attitude towards the subject

studied, and the use of videos as a learning aid. The sample was divided into two treatment groups and two control groups, where the treatment group was shown videos, and the control group was provided with the same instruction without videos during a unit on biological diversity. Assessment tests were used to measure achievement, and pre and post surveys, as well as interviews, were used to determine the effect of videos on attitude. After analysis with an independent t-test, it was found that there was no statistically significant difference in achievement, though the treatment group showed slightly higher gains.

The surveys showed no significant change in attitude towards video use or the content studied, however, the surveys as well as the interviews indicated that students felt positively about the use of videos in the classroom. If students like videos and find them useful, then over time it is possible that achievement would follow. Improving the way that videos are shown in the classroom could lead to higher gains in achievement.

2.4 Summary of Literature Reviewed

It is no longer hiding today that science influence man in all aspects of life including feeding, clothing, shelter, health care, communication, transportation, space exploration, as well as leisure (Elechi, 2010). The importance of science in development of the nation cannot be over blown. Science is a major subject taught in schools all over Nigeria and any nation that hopes to develop must not neglect the teaching of science in its schools. One of such science subject is Biology. Biology remains one of the basic sciences whose teaching and learning is universally known to be efficient and successful, if taught with sufficient and relevance instructional materials and method. Biology has been found important due to its relationship with life changing scientific courses such as Medicine, Zoology, Botany, Pharmacy, Biochemistry, and Biotechnology among others.

Although, being one of the core science subjects, low academic performance among secondary school students still surrounds the subject.

Resources for Biology teaching and learning are either in shortfall or lacking in schools due to insufficient fund. This has led to low achievement of students in Biology. There is therefore the need for improvisation of instructional resources and facilities for effective Biology teaching and learning in schools. Science teaching in Nigeria has changed from the mere glorification of nature study as it was before mid-1950s to systematize and an appropriate uniform science curriculum, teaching and learning the foreign nature of the content has been modified, emphasis is shifted from role learning to unrelated laws, definitions and concepts to concretization of knowledge. The problems of inadequate equipment and materials in Nigeria schools can be improvised by skillful teachers using local raw materials at their disposal. Science is not only an academic discipline for scientists but also an important tool of industry, medicine, agriculture and domestic comfort. Therefore the need for disseminating scientific ideals to students at the grassroots with the aids of concrete instructional materials becomes necessary. This will go a long way in solving the problem of poor enrolment of science students and poor performance at senior secondary school certificate examination.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

The design for the study is Quasi-experimental involving pre-test and post-test control group design. In this design, a total of two schools were selected and assigned into experimental and control groups. The experimental group was taught the structure of the Brain using a improvised split and align model of human Brain while the control group was taught the same topic with conventional method. A Biology achievement test was used to pre-test and post-test the two groups. The independent variable is, split and align model of human brain and the dependent variable is, academic achievement of biology students.

Table 3.1 Research Design Layout

Groups	Pre-test	Treatment	Post-test
Experimental	**O_1**	**X_1**	**O_2**
Control	**O_2**	**X_0**	**O_2**

Source: Field Work (2019)

Key:

X_1 = Treatment (instructional Materials)

O_1 = Pre-Test

X_0 = No Treatment (without instructional Materials)

O_2 = Post-test

3.2 Population of the Study

The population of the study consist of all biology students (15,634) in all the 20 public senior secondary schools in Bosso Local Government area of Niger State during the 2018/2019 academic session. While the target population is 131 SS2 biology students under Senior Secondary Schools in the same Bosso 131. The topic to be taught is also in their syllabus.

3.3 Sample and Sampling Techniques

The study used purposive sampling to sample two public senior secondary in Bosso local government area of Niger state. The schools for the study were sampled conveniently from the schools in bosso local government area. From each school, an intact class that offered biology as a core subject was used. One out of the sampled schools was used as the experimental group and the other school was used as the control group. The experimental group was exposed to treatment, in which they were taught nervous system using improvised split and align model of human brain while, the control group was taught the same topic using conventional teaching method.

3.4 Research Instrument

The instrument used for this research work was a Biology Achievement Test (BAT) designed to treat questions on the structure of the Human Brain and a split and align model of Human Brain structure. The Biology Achievement Test (BAT) was used as a pretest, to establish the equivalence of the experimental and control groups and also used as a post-test to ascertain achievement. Twenty (20) items of **Biology** Achievement Test were drawn from past West African Examination Council (WAEC) questions on Human Brain and textbooks. The questions were selected to cover both theoretical and practical knowledge to determine the effects of the available teaching material.

3.4.1 Validation of Research

The improvised human brain model was validated by experts from the Educational Technology Department in the school of science and technology Education, Federal University of Technology Minna Niger state. These experts examined the improvised human brain model in terms of fitness, suitability, acceptable technical quality, and practicability. Useful and constructive suggestions were made and noted.

The test instrument was face and content validated by experts from the Science Education Department and Educational Technology Department all in the school of science and technology Education, Federal University of Technology Minna Niger state. They scrutinized the instrument in terms of; clarity of instruction to the subject, proper wording of the items, appropriateness, and adequacy of the items for the study, structure and adequate timing. Comments and recommendations of these experts helped to modify the items in the instrument.

3.4.2 Reliability of Research instrument

A pilot study was conducted using the designed instrument in order to establish its reliability as well as the internal consistency index of the instrument. A total of 30 Students were selected for the test using a different secondary school in Minna metropolis, which was not used for the main study. The pre-test and post-test approach was used for the test. This means that the instrument was administered to the subject two times. Data collected were coded and subjected to statistical analysis using the statistical package for the social sciences. Using Pearson Product Moment Correlation (PPMC) and the R-value of 0.7 was obtained. With these coefficients the instrument could be considered reliable and internally consistent for the study.

3.5 Method of Data Collection

The researcher went to the school of study with written letter of introduction from the H.O.D Science Education to take permission from the administration of the school to carry out the study in the first week. In the second week, the pretest was administered to the students in the target population. The treatment (teaching) was carried out in the second and third weeks. In the fourth week, the researcher revised the study topic with the students and then administered the posttest.

Table 3.2: Breakdown of Data Collection Scheduled

WEEK	ACTIVITY
1	Visitation to school for permission
2&3	Administration of pretest and treatment (teaching)
4	Revision and administration of posttest

3.6 Method of Data Analysis

The t-test of significance between two means was used. It reduces the experimental errors and so increases the probability of rejecting the Null hypothesis when it is false. The mean and standard deviation were used for answering the research questions. The statistical analysis used to test the hypothesis was t-test. The t-test statistics were used to test all the two hypotheses and $P<0.05$ was the level of significance adopted for this analysis. It therefore, formed the basis of rejecting or retaining the null hypothesis.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Presentation of Results

A Biology Achievement Test was utilized in collecting data from the students who were placed into two separate groups, that is, the Control and Experimental Groups. Data collected were utilized in testing for the two research questions and two hypothesis theorized in Chapter One of this study.

Table 4.1: Pre-Test Result of Experimental and Control Group

	N	**Mean**	**S. D.**	***df***	**T**	**P-value**
Experimental	45	5.60	1.97			
				129	1.16	0.24
Control	86	5.14	2.21			

4.1.1 Research question one:

What are the mean achievement scores of students taught biology with improvised split and align model of human brain and those taught with lecture method?

Table 4.2: Mean Score of Control and Experimental Group

Group	N	Pretest score		Posttest score		Mean gain
		Mean	S. D.	Mean	S. D.	
Experimental	45	5.60	1.97	7.09	2.48	1.49
Control	86	5.14	2.21	5.31	2.36	0.17

The data on students' achievement in table 4.1 revealed that students taught biology using improvised split and align model of human brain had mean score of 7.09 with standard deviation of 2.48 while the mean achievement score of students taught without improvised split and align model of human brain was 5.31 with standard deviation of 2.36. Also the experimental group had a gain score of 1.49 over the control group who had a gain score 0.17 Therefore Students taught using improvised split and align model of human brain performed better than students without improvised split and align model of human brain.

4.1.2 Research question two

What are the mean achievement scores of male and female students taught biology with improvised split and align model of human brain?

Table 4.3: Mean Score of Male and Female Students in Experimental Group

Group	N	Pretest score		Posttest score		Mean gain
		Mean	S. D.	Mean	S. D.	
Male	41	4.88	1.82	7.38	2.80	2.50
Female	65	6.00	1.96	6.93	2.31	0.93

The data on male and female mean achievement score in table 4.2 revealed that male students taught biology using improvised split and align model of human brain had mean score of 7.38 with standard deviation of 2.80 while the female students taught biology using improvised split and align model of human brain had mean scores of 6.93 with standard deviation of 2.31. These results shows that both male and female students performed better when taught biology with improvised split and align model of human brain.

4.2 Research Hypotheses

4.2.1 Research Hypothesis One (HO_1)

Ho_1: There is no significant difference between the mean achievement scores of students taught biology with improvised split and align model of human brain and those taught with lecture method**.**

Table 4.4: t-Test Statistics Result of the Post-Test Scores of Experimental and Control Group

	N	Mean	S. D.	*Df*	t	P-value	Remark
Experimental	45	7.09	2.48				
				129	4.01	0.0001	S
Control	86	5.31	2.36				

The result of the table 4.3 shows that experimental group has the mean scores of 7.09 with the standard deviation of 2.48 while the control group has the mean scores of 5.31 with the standard deviation of 2.36. It can be noted from the result above that students taught biology with improvised split and align model of human brain had a better mean score than those taught without the use of improvised split and align model of human brain. The table revealed the p-value of 0.0001 ($P<0.05$). Hence, the null-hypothesis is rejected because there was a significant difference in the performance of students taught biology with improvised split and align model of human

brain when compared with those taught biology without the use of improvised split and align model of human brain.

4.2.2 Research Hypothesis Two (HO_2)

Ho_2: There is no significant difference between the mean achievement of male and female students taught biology with improvised split and align model of human brain.

Table 4.5: t-Test Statistics Result of the Post-Test Scores of Male and Female Students in the Experimental Group

Gender	N	Mean	S. D.	*df*	t	P-value	Remark
Male	16	7.38	2.80	43	0.57	0.57	N.S
Female	29	6.93	2.31				

Not significant at $P \leq 0.05$

Table 4.4 above shows the mean achievement score of male and female students taught with the use of improvised split and align model of human brain. The male students' recorded mean score of 7.38 with the standard deviation of 2.80 while the female students recorded the mean score of 6.93 with the standard deviation of 2.31. The table also revealed the p-value of 0.57 ($P>0.05$). Thus, the null-hypothesis is accepted because there was no significant difference in the achievement of male and female students taught biology using improvised split and align model of human brain.

4.3 Summary of Major Findings

The following summary emerged from the study:

From the analysis and presentation of the result, the finding is thus summarized according to the research question and hypotheses formulated for the study.

1. Students taught using improvised split and align model of human brain performed better than students without improvised split and align model of human brain.
2. Female students taught human brain using improvised split and align model of human brain performed better than male students taught human brain using improvised split and align model of human brain.
3. There was a significant difference in the performance of students taught biology with improvised split and align model of human brain when compared with those taught biology without the use of improvised split and align model of human brain.
4. There was no significant difference in the achievement of male and female students taught biology using improvised split and align model of human brain.

4.4 Discussions of the Findings

Result from table 4.1 showed that, the experimental group has the mean scores of 7.09 with the standard deviation of 2.48 while the control group has the mean scores of 5.31 with the standard deviation of 2.36. It was noted that students taught biology with the use of improvised split and align model of human brain had a better mean score than those taught without the use of improvised split and align model of human brain. Thus, the experimental group achieved higher than the control group. Result of table 4.2 Showed that, male students taught using improvise

split and align model of human brain have a mean achievement score of 7.38 with the standard deviation of 2.80 while female students recorded the mean achievement score of 6.93 with the standard deviation of 2.31. These result shows that both the male and female students taught biology with improvised split and align model of human brain had a good performance. The finding from table 4.3 (hypothesis one) , revealed that students taught with the use of improvised split and align model of human brain have a mean score of 7.09 and the standard deviation of 2.48 while students taught with lecture method had a mean score of 5.31 and standard deviation of 2.36. These results shows that the students taught using improvised split and align model of human brain had a better mean score compared to those taught without improvised split and align model of human brain. Also, p- value of 0.0001 ($P<0.005$) was obtained. Thus, the null-hypothesis was rejected because there was a significant difference in the mean achievement scores of students taught biology with improvised split and align model of human brain and those taught without the improvised split and align model of human brain.

Result from table 4.4 (hypothesis two) revealed that, there was no significant difference in the mean achievement score of male and female students taught biology with improvised split and align model of human brain. The result showed the mean achievement score of male students taught using improvised split and align model of human brain as 7.38 and standard deviation of 2.80 while the mean achievement score of female students taught biology with improvised split and align model of human brain was 6.93 and standard deviation of 2.31. Also, the p-value was 0.57 ($p>0.05$).thus, the null hypothesis was accepted

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings of the research work; as well as conclusions drawn based on the findings. Also contained in this chapter are recommendations and suggestions for further studies.

5.2 Summary

The study set out to determine Effect of improvised split and align model of Human Brain on the academic achievement of biology students in Bosso local government area of Niger state. The study was guided by two research questions and two hypotheses were formulated and tested at 0.05 significance level. Quasi-experimental research design was adopted in this study. The target population of the study was all the senior secondary school two students in Bosso local government area of Niger state. A sample of 131 students was drawn from the population of 5,881 through convenient sampling. A test and a treatment instrument were used to obtained data for the study. Data collected from the study were analyzed using descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions, while t-test was used to test each of the hypotheses at 0.05 level of` significance. The study found out that, there is significant difference between the academic achievements of student taught biology using improvised split and align model of Human Brain and those taught using conventional teaching method. The study also found out that, the use of improvised split and align model of Human Brain in teaching biology is gender friendly.

5.3 Conclusion

From the findings of the study, it is safe to conclude as thus:

1. The utilization of instructional materials in teaching Biology in secondary schools is very vital to the achievement scores of the students.
2. Students taught with improvised split and align model of human brain have shown to perform better than students who were taught with conventional teaching method .
3. The gender of the students did not affect their ability to perform better what they have been taught.

5.4 Recommendations

Based on the results of the study the following recommendations are made:

1. Instructional model should be provided by ministry of education for effective teaching and learning of biology in Bosso local government area of Niger state and the state at large.

2. Workshops, seminars, conferences or orientation courses on biology should be designed to acquaint the teachers with the latest development in the field of biology as well as training on how to make use of instructional model for teaching and learning process.

3. Biology teachers should try to improvise instructional models in the teaching and learning of biology in secondary schools.

5. Government should provide funds to secondary school biology teachers to enable them improvise instructional materials for teaching biology.

6. The ministry of education should evenly distribute trained and qualified biology teachers to all the secondary schools.

7. The government should make educational technology a compulsory course in the teachers' curriculum of training colleges and colleges of education both in the state and federal levels.

8. Biology teachers should encourage both male and female students to be actively involved in learning biology.

5.5 Suggestion for Further Study

This study was delimited to Bosso local government area of Niger state. The findings might differ if all the local governments and rural schools in the state were involved in the study. The researcher considers this as a limitation to the present study. The following is therefore, suggested for further study:

i. The study could be replicated to cover all the local governments in Niger state.

ii. The study on the assessment availability and suitability of instructional model in implementing biology curriculum.

iii. Assessment of teacher's competency in the use of multi-media, instructional model in implementing social studies curriculum.

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APPENDICES

APPENDIX A

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

DATE: _____

SCHOOL: _____

CLASS: SS2 A ( ) B ( ) C ( )

GENDER: (SEX) MALE ( ) FEMALE ( )

SECTION B: Biology Achievement Test (BAT) FOR PRETEST.

Instruction: Tick (√) the correct option in the following questions

1. The adult brain weighs about;

A. 1.2 to 1.4kg B. 2.2 to 2.3kg C. 1.2 to 1.6kg D. 3.2 to 3.4kg

2. The most predominant part of the brain is;

A. Forebrain B. Midbrain C. Hindbrain D. Upper brain

3. ------- Coordinates the outgoing motor impulse from the cortex.
   A. Thalamus B. Medulla C. Pituitary D. Cerebellum
4. ------- Connect the forebrain with the hindbrain.
   A. Midbrain B. Corpus Callosum C. Spinal Cord D. Medulla
5. The hindbrain is composed of all the following except;
   A. The cerebellum B. The pons C. The medulla D. The thalamus
6. ------- Controls respiration, heartbeat, and digestion.
   A. Cerebrum B. Medulla C. Pons D. Hypothalamus
7. The two hemispheres are connected by a band of fibers called?
   A. Corpus callosum B. Cortex C. Hypothalamus D. Pons

8. The human brain consumes ------- per cent of the body's oxygen supply to generate energy for it activities.

   A. 30% B. 25% C. 15% D. 10%

9. The forebrain composed of all the following except;

   A. Cerebrum B. Thalamus C. Hypothalamus D. Pons

10. ------- Controls various aspects of mood and emotions, such as aggression, rage, fear,and pleasure.

A. Motor Cortex B. Sensory Cortex C. Cerebrum D. Hypothalamus

11. A broad band of fibres that connect lateral cerebellar hemisphere is called?

    A. Pons B. Thalamus C. Medulla D. Cortex

12. The brain is made up mainly of ;

    A. Neurons B. Cellulose C. Acid D. Marrow

13. Functions of the cerebrum includes one of the following;

    A. Receiving sensory information B. Urine control C. Coordination of body pasture D. Aggression control

14. The ovoid structure attached to the back of the forebrain is called?

    A. Hypothalamus B. Cerebrum C. Thalamus D. Cerebellum

15. The region just below the thalamus is called?

    A. Cerebrum B. Cortex C. Hypothalamus D. Spinal cord

16. The reflex movement of the eye muscles is control by;

    A. Forebrain B. Hindbrain C. Midbrain D. None of the above

17. In human, there are more than ------- thousand million in the brain.

    A. Chromosome B. Neurons C. Glycosides D. Membranes

18. ------- Controls and coordinates body posture and muscular movements, especially those that maintain the body's balance.

    A. Cerebrum B. Cerebellum C. Pons D. Medulla

19. All the following constitutes the main regions of the brain except;

    A. Forebrain B. Upper brain C. Midbrain D. Hindbrain

20. ------- Consists of two halves, the right and left cerebral hemispheres.

    A. Cerebrum B. Cerebellum C. Medulla D. Pons.

APPENDICES

APPENDIX B

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

DATE: _____

SCHOOL: _____

CLASS: SS2 A ( ) B ( ) C ( )

GENDER: (SEX) MALE ( ) FEMALE ( )

SECTION B: Biology Achievement Test (BAT) FOR POST-TEST.

Instruction: Tick (√) the correct option in the following questions

1. The adult brain weighs about;

A. 1.2 to 1.4kg B. 2.2 to 2.3kg C. 1.2 to 1.6kg D. 3.2 to 3.4kg

2. The most predominant part of the brain is;

A. Forebrain B. Midbrain C. Hindbrain D. Upper brain

3. ------- Coordinates the outgoing motor impulse from the cortex.
   A. Thalamus B. Medulla C. Pituitary D. Cerebellum
4. ------- Connect the forebrain with the hindbrain.
   A. Midbrain B. Corpus Callosum C. Spinal Cord D. Medulla
5. The hindbrain is composed of all the following except;
   A. The cerebellum B. The pons C. The medulla D. The thalamus
6. ------- Controls respiration, heartbeat, and digestion.
   A. Cerebrum B. Medulla C. Pons D. Hypothalamus
7. The two hemispheres are connected by a band of fibers called?
   A. Corpus callosum B. Cortex C. Hypothalamus D. Pons

8. The human brain consumes ------- per cent of the body's oxygen supply to generate energy for it activities.

   A. 30% B. 25% C. 15% D. 10%

9. The forebrain composed of all the following except;

   A. Cerebrum B. Thalamus C. Hypothalamus D. Pons

10. ------- Controls various aspects of mood and emotions, such as aggression, rage, fear,and pleasure.

A. Motor Cortex B. Sensory Cortex C. Cerebrum D. Hypothalamus

11. A broad band of fibres that connect lateral cerebellar hemisphere is called?

    A. Pons B. Thalamus C. Medulla D. Cortex

12. The brain is made up mainly of ;

    A. Neurons B. Cellulose C. Acid D. Marrow

13. Functions of the cerebrum includes one of the following;

    A. Receiving sensory information B. Urine control C. Coordination of body pasture D. Aggression control

14. The ovoid structure attached to the back of the forebrain is called?

    A. Hypothalamus B. Cerebrum C. Thalamus D. Cerebellum

15. The region just below the thalamus is called?

    A. Cerebrum B. Cortex C. Hypothalamus D. Spinal cord

16. The reflex movement of the eye muscles is control by;

    A. Forebrain B. Hindbrain C. Midbrain D. None of the above

17. In human, there are more than ------- thousand million in the brain.

    A. Chromosome B. Neurons C. Glycosides D. Membranes

18. ------- Controls and coordinates body posture and muscular movements, especially those that maintain the body's balance.

    A. Cerebrum B. Cerebellum C. Pons D. Medulla

19. All the following constitutes the main regions of the brain except;

    A. Forebrain B. Upper brain C. Midbrain D. Hindbrain

20. ------- Consists of two halves, the right and left cerebral hemispheres.

    A. Cerebrum B. Cerebellum C. Medulla D. Pons.

APPENDIX C

ANSWERS TO BIOLOGY ACHIEVEMENT TEST (BAT)

1. A
2. A
3. A
4. A
5. D
6. B
7. A
8. B
9. D
10. D
11. A
12. A
13. A
14. C
15. C
16. C
17. B
18. B
19. B
20. A

APPENDIX D

LESSON PLAN FOR EXPERIMENTAL GROUP

School	Bosso Secondary School
Date	22/05/2018
Subject	Biology
Class	SSI1
Unit	Nervous Co ordination
Topic	The Human Brain, Structure and Functions.
Apparatus	Chalkboard and Human Brain Model
Time	8:00 – 9:20 am
Duration	80 minutes
Reference book	Modern Biology for Senior Secondary Schools by Sorojini T.R
Previous Knowledge	The students have been taught, the basic components and the organization of the nervous system. The students are asked the following questions to establish a link to the present lesson; 1. State/mention the basic components of nervous system. 2. State/mention at least 2 functions of the structural components of nervous system.
Specific Objectives	By the end of the lesson, the students should be able to: 1. Briefly describe the human brain 2. List and briefly describe the components of the forebrain and state at least one function each of the components 3. Briefly describe and state at least1 function of the midbrain

4. State and briefly describe the components of the hindbrain and state at least one function each of the components

Introduction The teacher introduces the lesson by using a questioning method, assuming that all or most of the students may have seen a moving car or motor cycle. Then the teacher asks the students the following questions to elicit their response(s) in other to carry them along: 1. Have you ever seen a moving car or motor cycle? Possible answers from the students could be Yes Or No. 2. Could you mention some parts of the car or motor cycle? Possible answers from the students could be; the tires, the headlight, the car windows, the car stirring and or the engine. The teacher briefly explains to the students that a car or motor cycle cannot move without the engine. As the car or motor cycle has different parts been directed by the engine so does human beings have different body parts been directed by the "human engine" This human engine is the human brain.

THE HUMAN BRAIN

Presentation The teacher then presents the lesson according to the following steps:-

Step I The teacher describes the human brain as follows. The adult human brain weighs about 1.2 to 1.4kg. Although it forms only 2 per cent of the body's mass, it consume 25 per cent of the body's oxygen supply to generate energy for its activities. Thus the brain cells are the first react to low oxygen supply. They are also first to react to low blood glucose. The brain is made up mainly of neurones. In humans there are more than a thousand million neurons in the brain. These form the grey matter and the white matter. The brain has three main regions: the forebrain, the midbrain, and the hindbrain.

Step II The teacher uses the improvised human brain to list and briefly describe the components of the forebrain and state their functions.

The forebrain: As the vertebrate brain evolved and become more complex, the forebrain increased greatly in size. In humans it is the most predominant part of the brain and is associated or linked with higher brain functions like intelligence and speech. The forebrain is made up of; the cerebrum, the thalamus, and the hypothalamus.

Cerebrum: this consists of two halves, the right and the left cerebral hemispheres. The halves are connected by a band of fibres, the corpus callosum. This keeps the hemisphere informed of the others activities.

Functions of the cerebrum

1. Receiving sensory information,
2. Processing it, and
3. Sending out the necessary instructions along motor neurons to effectors to take appropriate action.

The thalamus- The thalami (singular: thalamus) are two ovoid structures attached to the back of the forebrain.

Functions of Thalamus

I. Receiving sensory information from various parts of the nervous system, integrating it and passing it onto the relevant regions of the cerebral cortex.

2. Coordinating outgoing motor impulse from the cortex.

3. It contain part of a network of neurons that arouses brain activity
The hypothalamus- This region is just below the thalami. Although relatively small, is one of the most interesting parts of the brain because it has so many functions.

Functions of Hypothalamus

1. Regulation of body temperature and the body's urges such as thirst and hunger by impulses it sends along the autonomic nervous system.

2. Controls of endocrine secretions by monitoring the metabolites and hormone levels in the blood

3. It is used for the regulation and control of heart rate, blood pressure, ventilation rate and peristalsis

4. It is connected to, and controls, the pituitary gland (the main link between the nervous system and the endocrine system and its hormones)

5. It control various aspects of mood and emotions, such as aggression, rage, fear and pleasure

Step III The teacher uses the improvised human brain to describe the midbrain and state it functions.

The midbrain-This region connects the forebrain with the hindbrain.

Functions of the midbrain

1. It controls the reflex movements of the eye muscles.

2. It controls the reflex movements of head, neck and trunk in response to visual and auditory stimuli, as well as changes in pup size and lens shape of the eye.

Step IV The teacher uses the improvised human brain to list and briefly describe the components of the hindbrain and state their functions.

The hindbrain: together with the midbrain, the hindbrain coordinates most of the body's automatic involuntary activities. The hindbrain composed of the cerebellum, the pons varolii,and the medulla oblongata.

Cerebellum- This is located at the back of the brain under the cerebral hemispheres. It is much folded and has an outer region, the cortex, which contains many nerves fibres and cell bodies. Like the cerebral cortex, it appears greyish in colour.

Functions of Cerebellum.

i. The cerebellum has been called the gyroscope of the body because it is concern with balance

ii. The cerebellum controls and co-ordinates body posture and muscular movements.

Pons. The Pons is a relay station between the cerebellum, spinal cord and rest of the brain (Pons means bridge)

Medulla oblongata- The medulla is one of the best protected parts of the brain and one of the most vital. It is at the posterior end of the brain that continues into the spinal cord. It has an outer region of white matter and an inner region of grey matter.

Functions of Medulla oblongata

i It controls many involuntary movements of the body, especially those concerned with respiration, heart beat and digestion

ii. It controls vasoconstriction and vasodilation of the blood vessels (thus regulating blood pressure).

iii. It control sneezing, coughing, swallowing, salivation and vomiting

Spinal cord- The spinal cord consists of thousands of neurons clustered to form a cylinder of nervous tissue. It runs down the length of the neural canal formed by the stacking of the vertebrae, and hence occupies a dorsal position in the animal's body.

Functions of the spinal cord

i. Coordinating simple reflex actions like the knee jerk and automatic reflexes such as sweating, contraction of the bladder

ii. Acting as a pathway between the spinal nerves and the brain

Evaluation The teacher evaluates the extent to which the specific objectives have been achieved through the following questions below;

1. Briefly describe the human brain.

2. List and briefly describe the components of the forebrain state at least one function each of the components.

3. Briefly describe and state at least one function of the midbrain.

Conclusion A very brief summary of the lesson

Assignment Draw a well labeled diagram of the human brain.