IMPACT OF INSTRUCTIONAL MATERIALS ON EFFECTIVE TEACHING AND LEARNING OF BIOLOGY AMONG SENIOR SECONDARY SCHOOL STUDENTS IN GOMBE METROPOLIS

BY

ILIYA SALEH
REG NO. 2011/UG/BIO/00565

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APPROVAL PAGE

certify that this project report entitled "A comparative analysis of students achievement in Biology at WAEC/NECO examination in Gombe Metropolis and carried out by Samaila Yerima in the department of Biology Education, School of Science education Federal College of Education (Tech) Gombe in affiliation of university of Maiduguri Borno State Nigeria meets the prescribe Regulations and is approved for its contributions to knowledge.

G. I. Musa
Project Supervisor
Sign: ..... Date: 04/11/15

Z. D. Thomas
Coordinator, Biology
Sign: ..... Date: 04.11.2015

Dr. U. A. Kwanu
Dean School of Undergraduate Studies
Sign: ..... Date: 9/12/15

.....
External Supervisor
Sign: ..... Date: .....

DEDICATION

his project work is dedicated to God Almighty. And to my late mother Mrs. amatu Saleh Gin whom through the help of God brought me to this planet Earth ut could not wait to reap the fruits of her labor. May her gentle soul rest in erfect peace. Amen.

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of all I sincerely appreciate God Almighty for given me the strength and age to make this project work successful one.

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ABSTRACT

The research was conducted in an experimental manner to investigate the impart of instructional materials materials on effective teaching and learning of biology among senior secondary school students in Gombe metropolis. The studied adopted post-test only experimental research design through which a test was administered to parallel group of students after treatment. The study sample comprises of one hundred (100) students randomly selected from the five (5) schools as the sample from the entire secondary schools offering Biology in the study area. Two sets of questionnaire were developed and administered to the students, who were assigned in to CONTROL and EXPERIMENTAL GROUPS. To guide the direction of the study, three research questions and three hypotheses were formulated and the dota collected were analyzed using mean scores, frequencies count, percentile, t-test statistics and chi-square methods. Literature was reviewed and acknowledged materials consulted. The result showed that instructional materials significantly influenced achievements and attitudes of students towards Biology and also indicated the direct proportionality of achievement and attitude such that any effect on one may affect the other. It was concluded that instructional materials significantly influence students' achievement and attitude towards Biology. It was recommended that students and teachers should make good use of instructional materials and urge curriculum developers and implementers with all other stakeholders involved to put hands together and transformed instructional facilities, organizes seminars and workshops for Biology teachers on the good use of instructional materials. It was suggested that similar research should be conducted in another geographical area.

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CHAPTER ONE

1.1 Background of the Study.

Since time immemorial, teaching and learning have been done by different methods; such as lecturing and explanatory as the dominant strategy which encourages rote learning. Teaching and Learning in 19th, 20th and 21st centuries are enhanced by the use of instructional media or materials. This considers the sense of sight as the most effective for retention of ideas, experience and events. This is in line with the saying of Jensen, 1997 that at least 87% of students in any given context are visual learners [Tileston,2004].

Teaching-learning can be said to be a process of behavior modification. Teaching is the act of imparting culture, knowledge skills and values to students or learners by the teacher; while learning is the act of acquiring culture, knowledge skills and values by the learners from the teachers.[Olaita and Agusiobo, 1981]. The culture, knowledge skills and values are the transitional changes taking place within an individual developmental stage in behavior that contributes to better living.

The recent discussant issue in education was an agitation about the pro

Found fallen standard of education [especially the student's achievements and attitudes]. Education is the heart of every nation and the key to any development.

Many factors have been put on instructional materials. The effectiveness of instructional materials cannot be over emphasized as have been raised by many researchers, it is an efficient tool for regaining student's attention and focus, it reduces the rate of disturbance, illusion and hallucination increases the intensity, specification and direct students attitudes. These make teaching effective, learning meaningful and permanent.

The basic assumption or goals of teaching science are to develop student's knowledge and understanding of the world and facilitate their acquisition of skills in the investigation of natural phenomena. Accordingly. Erinosho [2008], emphasized the provision of appropriate learning episodes as requisites to achieve these goals which she said will enable students embrace the underlying values in the assumptions of science and grasp the embedded meaning in their investigation of the world.

National research council [1997] and smith [2007] defined teaching as the process of carrying out activities that provide students with experience that can induces learning. Similarly, Farrant[1990] defined learning as the process of acquiring and retaining of knowledge, skills, attitudes, understanding and capabilities that cannot be connected with inherited behavior patterns or physically growth Erinosho [2008,p.2] posits that, ...science teaching take place when a teacher organizes a series of practical experience in scientific activities, the

intention of which is to make students learn new knowledge and acquire skills and competence in science.

Biology; as a science discipline is essentially a practical subject and therefore involves highly equipped laboratory and field skills. Although factual knowledge can be important, but understanding how to find and evaluate information rated higher than the ability to memorize facts[Jones, Reeds and Weyer, 2007]. Ramalingam [2007] described Biology as a charming study that ranges from microscopic cellular molecules to the biosphere, encircling the earth's surface and its living phenomena at their natural settings and use the scientific method to revealed the mysteries of life [Ramalingam 2007].

In view of these the use of instructional materials is said to be a major concerned in teaching and learning of Biology. These instructional materials could be visual, audio or audiovisual appropriate the use of instructional materials to attract the attention of students and thus effective teaching should be of more practical benefit [Kumar 2008 and Susan, 2006].

Therefore the use of instructional materials do not only motivates students but also attracts their attention and promotes readiness and interest in them which are necessary for effective teaching and meaningful learning. This is because attention, readiness and interest are essential for the proper perception and

retention of ideas. The reverse is the case when instructional materials are poorly used or not used at all.

1.2 Statement of the Problem.

Since scientific knowledge is believed to be evidence-based, Biology as one of the three basic pure-sciences most involves practical skills and experience to proof the aforesaid nature of science.

Looking at the popularity of ordinary lecture, explanatory and teacher centered methods devoid of instructional materials encourage rote learning assimilatory or verbatim memorization and the emergence and domination of new teaching techniques characterized by instructional materials , which involved the use of concrete materials to facilitate the use of instructional materials is inimical to teaching-learning process. It is against this that the researcher enticed to investigate and examine the impart of instructional materials on secondary school students towards Biology in Gombe metropolis. Positive or negative impact of Biology science has been attributed to none or poor use of instructional materials. Furthest, the zeal and morale of learners is dampened thus apathy towards Biology. These constitute the problem of the study.

1.3 Research Purpose.

This research is purposely designed to determine the impart of instructional materials on teaching and learning of Biology. On general note the uses of instructional materials in teaching and learning process cannot be over emphasize. Therefore the specific objectives of the study were to;

1. Help both teachers and learners to rediscover the need of using instructional material to promote teaching and learning of Biology.
2. Determine the impart of instructional materials on the teaching and learning of Biology.
3. Find out the attitude of learners toward the used of instructional materials.

1.4 Research Questions:

The following research questions were posed to guide the direction of the study;

Q1. What is the role of instructional materials in teaching and learning process

Q2. To what extend does the use of instructional materials in Biology enhance teaching and learning in and outside classroom situations

Q3. Does the use of instructional materials make teaching and learning to be real?

Q4. Does the use of instructional materials truly capture learner's attentions?

1.5 Hypothesis.

The following hypotheses were posed to verify the variables of the study;

1. The use of instructional material has no influence in teaching and learning? There is no significant difference between the use of instructional materials on teaching and learning.
2. Instructional material has no tendency to promote teaching and learning?
3. There is no significance relationship between instructional materials and effectiveness in teaching and learning process
4. Instructional materials could be substituted with good method of teaching

1.6 Significance of the Study

The fact that the use of instructional materials is pre-requisite to effective teaching and meaningful learning, the result of this research will be of benefit to the following;

TEACHERS; it encourages them to enrich their lesson with proper and effective use of instructional material.

STUDENTS; it will help them to realize the roles of instructional materials and pay more attention and curious while experimenting and to even explore on their own for more knowledge. The result will boost their morale and achievement in Biology.

PARENT; it will encourage them provide their children with hard and soft ware's of instructional materials to facilitate the students understanding and achievement.

CURRICULUM PLANNERS;

The result will assist curriculum planners and developers to put more emphasis on the use of instructional materials as it will enable students to use their senses while learning. This aids retention, permanency and understanding of concepts which also discourage rote learning.

OTHER REGULATORY AGENCIES AND STAKEHOLDERS; will find the results useful because the use of instructional materials will ensure transparent, self-dependent, independent learning. And egalitarian society and for meaningful learning.

1.7 Scope of the Study;

The research work is restricted to only senior secondary schools in Gombe metropolis. It focuses only on the impart of instructional materials in effective teaching and meaningful learning of Biology.

1.8 Theoretical frameworks.

The theories that explained the variable in this research are learning theories .these learning theories can be classified into two major divisions;

1. The behavior-associations or connectionist theory.
2. The cognitive-organizational or cognitivists theory.

1.8.1 Connectionist Theory of Learning;

Connectionist theory of learning is based on stimulus-response [S-R]. this theory can best be explained by the following principles;

1. When stimulus-response occurs at the same time in close contiguity, the connection between them is strengthened.

2. The strength of connection between stimulus and response depends upon the frequency of stimulus-response repetition.
3. The most recent response is strengthened more by its frequent occurrence than the earlier response.
4. Practice is useful because it helps knit the stimulus-response bond together to form a larger unit of behavior.
5. Learning is the result of R-S connections formed in the brain and reinforced by some rewards which acts as a motivator for repeating the same action.
6. Forgetting is due to or caused by lack of practice.

1.8.2 Cognitivists Theory of Learning.

According to this theory perception of problem is the starting point. The theory is based on perception and problem-solving processes. The proponents of this theory proposed the law of perceptual organization which refers to stimulus variable such as the figure and ground proximity, similarity, common direction and simplicity they view practice as successive expose to learning situation.

The following are the four features identified by Bruner that encompasses the instructional theory;

1. The principles emphases the connection of experience that stimulates child's willing and confidence.
2. The knowledge body should be simple and understandable.
3. Materials should be presented logically.
4. It should be rewarded or reinforced and the reward should move from extrinsic to intrinsic.

1.9 Operational Definition of Terms;

The following terms are defining in the context of this work and are to be understood as used;

1. Instructional materials; any tool or activity practical experience, use of chart or model, drama and fieldtrip. Introduce by a teacher in order to gain students attention and interest for better understanding maximum retention and higher achievement.
2. Impart; the act of putting in knowledge skills and values to the learners.
3. Teaching; the act of imparting culture knowledge, skills and values to learners by the teachers.
4. Learning; is the act of acquiring culture, knowledge, skills and values by learners from the teacher.

CHAPTER TWO

REVIEW OF RELEVANT LITERATURE.S

2.1 Historical s the use of instructional materials.

Learning meant watching listening, and becoming an integral part of the practical, oral, and repeated tradition of the community [Encyclopedia, 2004, p.645]. Before the human structure civilization early man, used and guided by trial and error. he was able to discover the three human basic needs—food, clothing and shelter—which are necessary for the survival of human race. His education was qualitative and result oriented because he learned from experience and by observing others [Majasan, 1998].

The emergence of human civilization characterized with temple formation and King-priest. These kind of groups or temples formation emerged with the growth of organized religion and the invention of writing ---initially in the form of representational pictograms-—came scribes and school for training of scribes or king-scribes. The first school [formal school] was established in Egypt in the Nile-Valley for the training of priest, but before long it was offering art, architecture, advance mathematics and science. The Egyptian civilization was marked with the developing hieroglyphic writing and arithmetic later introduced astronomy,

vented a solar calendar, created variety of writing materials, and emphasized structions in some practical subjects such as applied mathematics, business counting and medicine from the Sumerian use of pictogram grew increasingly to mplex form of writing and eventually an alphabet. Their own writing produced n sun-dried bricks instead of papyrus used by the Egyptian [Majasan, 1998 and ncyclopedia, 2004].

However the early industrial revolution evolved with a difference on nstructional process .during this prior instructions relied heavily upon simple nings like; the slate, the horn, the blackboard and chalk. With the increased levelopment in technology by the 19th century materials such as charts, maps, pictures and other audiovisual aids become part and parcel in the education system. The drastic revolution in educational system was experienced by the 20th century for which instruction began to convey through the media and the use of other sophisticated devices like radio, talking typewriter, microscope and computer [Aggarwal, 2007].

2.2 Effectiveness of Instructional Materials.

However, no society can exist without it new members being trained or imparted by knowledge, values, norms, culture and other interactive advancement of the society. Although, some knowledge are acquired among the individual by

inheritance, but environmental influence must be formally or informally acquired through generations for the better future of the next generations to come. Hence, what is striking is the method or how these norms, values, culture, knowledge, and environmental changes can be passed through generations. The most effective method that ensures accurate communication is the one involves the use of instructional materials which appeals to almost all senses.

Research work in Nigeria by Obemata [1991], balogun [2002], Adeyegbe [1993], Njoku [2000], identified the problem of adequate professional sound and enduringly committed teachers with needed ingenuity to improvise and utilize appropriate instructional materials to enhance better learning [Adeniran, 2006]. Other researchers observed the high cost of production of scientific equipment, difficulties.

Encountered in purchasing them, lake of fund with the increase in school enrolment as the underlying factors for the purpose of laboratory in Nigerian schools. Adeniran [2006] added that absolute negligence of improving the quality of schools through provision of sufficient and necessary instructional materials/facilities worsened the situation which in turn reflects on the students result.

Furthermore, Osinem [2006]. Opined that for the purpose of effectiveness nd getting a worthwhile result, theory and practical must be fully integrated in to eaching-learning process. Quality education is the one that its receivers lemonstrate acquired skill, knowledge and successfully interested in any given ontext [Wasagu, 2002]. Ideal instructional approach must offer students hallenging situation, interesting activities, illustrations and rich materials for earning that foster thinking, creativity and production, answer specific scientific roblems and promote curiosity and interest in them [Muhammad and Mango, 003, Okachi 2006]. Tileston, [2004] revealed that about 87 percent of information oming into the brain is through senses. Kumar [2008] stressed that the most ffective teaching is the one that appeal to many senses.

.3 Importance of Instructional Materials.

' as aptly observed by the commission on higher education. By contrast, echnology, agriculture and other practical subjects, particularly at the sub- rofessional level, have not won esteem. It is a small wonder , then , that training or qualifications other than degrees, especially in technology is not popular." Fafunwa , 1974,p.174-176].

Abundant research findings suggested the significant contributions of instructional naterials and media to effective , efficient and conducive learning [Ibe-Bassey,

005]. The goals of instructional materials is to have students behave like scientist, his approach requires more involvement of learners with concrete objects and less eading science. These resource participatory activities integrate and make science earning functional [landu, 2006], Bilesanmu-Awaderu [2002] suggested that quipping student with manipulative equipments and observing experiments during aboratory activities acquaint the students with high acquisition practical skills and ositive attitude towards laboratory work.

The use of instructional materials such as visuals , auditory and kinesthetic s teaching strategies no only attract students attention but also significant in topping delinquency , school dropout and other act of students'. Mishaving such s absenteeism, bullying, playing or making noise during lesson [Tileston, 2004 nd Suckow, Douglas and Weichbrod, 2002]. Olaita and Agusiobo [1981] naintained that the use of instructional materials by teachers help to stimulate the nterest of students, make learning more permanent and meaningful and provide xperiences not easily secured in other ways.

Accordingly, research has shown that, learning science using the process and ctivity-based approaches improve students' ability to apply intellectual skills to olve problems and language development skills and promote creativity and master cience content better, and to develop positive attitude towards science and scientists in general and Biologist in particular [Landu, 2006]. Appropriate and

ffective use of instructional materials offer a reality of experience which induce ndividual activity and motivate students to investigate or explore thereby ncreasing voluntary reading [Olaita and Aguisiobo , 1981]. The quality of every ffective instructional material is its ability to;

a. Appeal to as many senses as possible if not all [especially, hearing and seeing].
b. Attract and hold attention of the learner.
c. Focus the attention on essential elements to be learned at a proper time.

2.4 Nature of Science and Biology.

2.4.1 The new edition of the dictionary of popular English defined science as the knowledge arranged in an orderly manner, obtained by observation and testing of facts , pursuit of such knowledge. The term science was derived from the latin word. 'scire' which mean 'to find out' [Ewer , Hall and Mitchelmore, 1975]. Scientists are constantly engage in inquiry and finding out, their new finding are added to the existing body of knowledge. It is clear that there is no way for a student of medical school, engineering or other schools of vocational and technical education to make it without acquiring the basic pre-requisite knowledge of science. Therefore, science teaching should be based on practical skills. Similarly, Nigeria of ANCOPSS [2000] emphasized that, to better handle the profession, the

oblems of inadequate laboratories/ laboratory equipments' and other basic eded materials for practical and field skills should be clear out.

Hence, science is a systematized, organized and facture body of knowledge hich has a unique characteristic of observation experiment, verification and odification in the light of new finding. Therefore, science teaching can be said to ve taken place when a teacher organizes a series of practical experiences in ientific activities with the intention to make student learn new knowledge, the quire skills and competence in science [Erinosho,2008] Like other fields, ience has its own special methods of enquiry, assumptions and attitudes [Ewer, ll, Mitchelmore 1975].

2.4.1.1 Assumptions and Attitudes of Science.

a. The following are the basic assumptions of science

i. The world is understandable;

ii. Scientific knowledge is open to change;

iii. Scientific knowledge is evidence –based;

i. Science cannot provide complete answers to all questions;

v. Scientific method is specific;

vi. Science is a blend of logic and imagination;

vii. Science is enquiry;

viii. Science is value-free and unbiased;

ix. Science is not authoritarian but an enterprise;

x. Scientific enterprise is bound to ethics.

b. The following are values and attitudes of science.

i. Honesty and accuracy in recording and validating date;

ii. Interest and curiosity in exploring the environment;

iii. Objectivity and unbiased attitude;

iv. Openness to challenging exciting ideas;

v. Healthy skepticisms about claims and arguments;

vi. Respect for the use of evidence;

vii. Logical and rational thinking;

viii. Confidence and independence;

ix. Collaboration and team spirit; and

x. Persistence in the face of failure, and respect for nature.

1.2 The Scientific Method.

The scientific method is a systematic process of providing valid and tested lution to problem about an event or natural phenomena. It includes

Observation and Problem Identification.

Observation is the first stage in understanding the environment. It requires e use of sense,[especially, smell, sight, touch, and hearing] to produce formation and facts that may be translated in to an description of the problem to explored. It involves the use of words or numbers. Therefore, a science teacher expected to provide sufficient opportunities for student to understand their rrounding through the observation of events which can help them discover tterns that would lead to questioning or identifying the problem.

Formulation of Hypothesis.

Hypothesis is a statement predicted to provide testable explanation for a oblem being identified, usually derived from the past experience or findings.

Identification and Control of Variables.

Factors are identified in order in order to test the hypothesis. The factors are e attributes that are subject ti investigation. The factors are referred to as riables because they can assume different values on the attributes that are to be

easured. The variables could be dependent, what is to be measured or dependent, the treatment condition. The variables are other factors that may fect the outcome but whose direct effect are not being investigated in the periment.

d. Investigation and Data Collection.

Data collection requires the use of standard instrument or equipment [either laboratory or field equipment]. Depending on the nature of experiment, data are collected from participant or subject to ascertain the patterns of behavior. The patterns

of data can be described in graphs, tables, or illustration.

e. Interpretation and Conclusion.

The obtained dates from an experiment are analyzed using statistical procedure the results may support or fail to support the hypothesis formulated. When the evidence supports the hypothesis, means there is an association between the variables, thus the prediction is accepted. If the result does not show association between the variables, independent and dependent, then the hypothesis is rejected.

Hence, students must learn the scientific method as an endless process that will be continue to apply in solving problems and generating new problems.

2.4.2 Nature of Biology.

Science can broadly be classified in to apply and pure science. Biology is among the three basic pure sciences which bear several branches including some applied branches such as agriculture. The biology is coined from two Greek words, bios; life and' logos' study. Therefore biology can simply be defined as the study of living thing or life.

Additional biological studies have three basic principal vocational fields which include; agriculture, pharmacy and medicine. Agricultural studies may be classified in to animal husbandry, plant breeding, forestry, ornamental horticulture etc. in fact, no field of study that is exceptional in terms of requiring biological knowledge [Ewer, hall and mitchelmore, 1975]. Laboratory work as been regarded as an integral and necessary aspect of the learning experience in science in general and biology in particular[Osinem, 2006]. Hence, biological curriculum does not give room for occasional practical activities since theory and practical experience have to go hand in hand.

Furthermore, to meet up the provision of the Nigeria national policy on education, Maxwell-ojo and Uma[1989] and Erinosho(2008).Opined that biological teaching must provide students with ;

a. Adequate laboratory and field skills in biology;

b. Meaningful and relevant knowledge in biology;

c. The ability apply scientific Knowledge to everyday life in matter of personal and community health and agriculture; and

d. Reasonable and functional scientific attitude.

onsequently, Maxwell-ojo(1082) and Maxwell-Ojo and Uma (1989) irther affirm that the content and context of the biological curriculum/ yllabus must placed emphasis on the field studies, guided discovery , aboratory activities and skills with conceptual thinking. Osinem (2006), rgue that poor attitude of students' towards agricultural occupation and general apathy towards farm practice may not be isolated to students ' lack of exposure to appropriate learning experience in the field due to lack of ctivity-based instructional facilities during instruction.

2.5 Kind of Instructional Resources for Teaching Science and Biology.

Instructional resources could be human or non-human resources. Human resources are people within or outside the school premises that serve as reference for learning. Teacher colleague could be in a position as a resource to explain certain phenomena/issue which he/she has a better understanding. While a community-based, resources could be a medical

doctor that will complement the classroom instruction process to provide support and other essential informal experiences.

The non-human resources are materials, tools and other equipments that are design to support teaching-learning process. These materials include; text books, soft ware's, audio media, printed materials, charts, visual materials, and audiovisual materials.

a. Audio Media.

These are resources that convey information through sound. Examples of such resources are audiotape and radio. These materials are effective for auditory or aural learners. It can record and replay events, stimulate verbal messages that aid understanding and are readily available at minimal cost.

b. Visual Media.

Visual resources convey information by sight. They are effective r provide for visual learner. Example of these resources are ; video cassettes, projected visuals, such as overhead projector and power point , and non-projector visual; like graphic materials, laboratory equipment and chemicals, display boards, models, flip charts, specialized equipment; calculators, drawing board, and real object; animals, plants, chemicals.

c. Audio-Visuals.

These are materials that convey information by both sound and sight such materials provide opportunity for both aural and visual learners because they produce or provide both aural and visual information, example, television and computer.

mpart of Instructional Materials on Students' Achievement.

Lack of instructional materials to serves as teaching aids that facilitate quick rstanding of the subject matter in the classroom is a great impediment to ucive learning environment for science, technology and mathematics ation(Maitafsir, 2003) also emphasized the importance of using models in gical teaching such as sectional models of different body organs and systems, maintained that if became necessary such materials should be improvised from cal community resources to ensure maximum retention of knowledge.

Also , Retting and Canady (1996) report that students demonstrated icantly higher achievement in the school where active learning method were sive (Okachi, 2006). Active involvement of students in practical activities gh experimentation enhances their academic performance (Muhammed and o, 2003, Ndu, and Aina, 1990, Landu, 2006).

Erinnosho (2008) emphasizes the provision of appropriated learning ;odes as requisites to achieve these goals which will enable students embrace underlying values in the assumption of science and grasp the embedded ining in the application of the scientific methods in their investigation of the ld.

The use of instructional materials not only draws the attention of students but motivates and instincts interest in the students for the activity involved. These ince students, achievement and attitudes towards the course (Kumar, 2008 garwal,2007, Tileston (2004) and Dubey,Dubey and Ndagi, (1985).

Conclusion.

Going by preceded literature, researches from various contexts have shown the importance and impact of instructional materials in facilitating rstanding and enhancing achievement of students cannot be over emphasized. retentive capacity of the brain is solely dependent upon the use of senses h produces up to 98% of all the information stored in the brain. The relevance ience and biology to instructional materials was highlighted by suggesting evidence –based nature. Besides enhancing achievements and attitudes of nts concretizing learning and insuring effective teaching and meaningful ing, certain problem have been identified such as;-

(i) Inadequate professional sound and enduring committed teacher with needed ingenuity to improve and utilize the instructional materials to enhance better learning;

(ii) High cost of production and difficulties encountered in purchasing scientific equipment;

(iii) Lack of funding and increased in school enrolment which are the underlying factor for poor laboratories in the Nigerian secondary schools;

(iv) Absolute negligence of improving the quality of schools through the provision of sufficient and necessary instructional facilities and resources ; and

(v) Examination-driven content-delivery approach.

These problems were suggested to be the major hurdle to the less popularity of this approach and worsen the situation which in turn research should be adopted to investigate the extent to which the use of instructional materials influence achievement of students and their attitudes towards learning biology in Gombe metropolis of Gombe state.

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CHAPTER THREE

METHOD AND PROCEDURE

3.0 Introduction

This chapter addresses the various methods and procedures involve in the study that were adopted for better results. These methods and procedures ranges from study design, population and sample, sampling techniques, instrument (s) used in data collection; its description, scoring and reliability/ validity, as well as procedures for data collections and analysis.

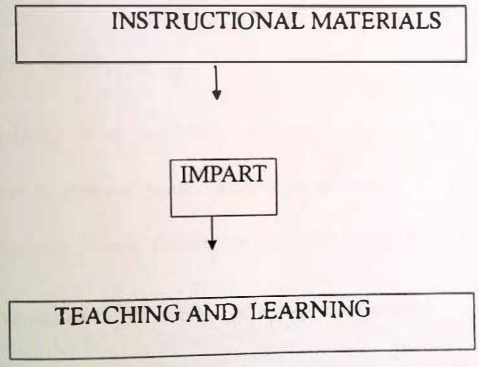
3.1 Design of the study

The study adopts experimental research design. However, post-test-only experimental design was used. Experimental design involves driven of verified functional relationships among phenomena under controlled condition (Osuala, 2005). It is usually adopted to identify the conditions underlying the occurrance of a given phenomena. It is operationally a matter of varying the independent variable(s) and measuring its effect on dependent variables. The unique advantage this design has over others is that it enables the researcher to improve the conditions under which he/she observes and thus, to arrive at more precise results. These scientific nature, make it more appropriate, than all other design, for this research. This design can be represented as:

Fig 1: Nature of the post-test design

	Independent variable	Dependent variable
R.	Experimental group	Measure(Subjects)
R.	Control group	Measure

Fig 2: Interrelationships between the variables based on the research questions.



2 Population and Sample

2.1 Population

The target population covered all the senior secondary school students in Gombe metropolis.

3.2.2 Sample

There are twenty-five schools in the study area that are offering Biology out of which five (5) schools were drawn to be the sample in investigating the impart of instructional materials on secondary school students' achievement and attitudes towards Biology. Twenty (20) students were sampled from each of the schools to represent one-third (1/3) of a group, thereby making the total sample of the population to be one hundred (100) students.

3.3 Sampling Technique (s)

The schools were randomly selected using the hart and draw method with replacement to ensure equal chance of selection for each of the elements that make-up the population. Below are the schools that have been sampled:

1. Government Science Secondary School Gombe
2. All Saint College Gombe
3. Government Day Secondary School Pilot
4. JIBWIS Islamic Science Secondary School Gombe

Government Day Secondary School Orji

4 Instrument(s)

The major instrument used to obtained the data in this study was questionnaire veloped by the researcher, which served as tool for collecting data that would be alyzed to answer the research questions formulated in chapter one.

4.1 Description of the Instrument(s)

The instrument mainly consists of two parts. Part ' A" is to test the impart of structional materials (IIM) which composed of ten (10) questions developed after ing the materials to treats a particular topic and part "B" is the students attitude wards Biology (SATB``1) also consist of ten (10) items.

4.2 Scoring of the items

The scoring of part A was through simple response counting. Double sponse or rejections of responses were counted invalid, and incorrect responses ere scored as zero (0).

he part B of the questionnaire assumed a likert-type scale of measuring attitude id it was scored through assigning of numbers (1,2,3,4,5) to each of the tegories (SA, A, U, D, SD) in either of ascending or descending order, depending the direction of the statement. For example:

tatement are expressing positive attitude were scored as:

SA=5, A=4, U=3, D=2, SD=1.

Statement are expressing negative attitude were scored as:

SA=1, A=2, U=3, D=4, SD=5.

The total scores of the respondent indicated his/her attitude. Higher score (above he mean score) indicated positive attitude and lower score (below the mean score) ndicated negative attitude.

.4.3 Reliability and validity of the instrument(s)

The internal consistency reliability of the instrument has been tested and a eliability coefficient of the subscales ranging from 0.81 to 0.89 was obtained /hich suggest high reliability. This was obtained using Spearman-Brown formula f split-half method of establishing reliability. Hence, construct validity of the ems was checked by two experts from the Faculty of Education, Gombe State /niversity.

.4.4 Procedure for Data Collection

The researcher, with the permission of the school principals and the ssistance of the Biology teachers, taught the concepts and administered the strument, given enough time for appropriate response of items by the students. he scripts were returned immediately for data analysis.

.4.5 Methods of Data Analysis

The data collected were analyzed using mean scores and standard, eviation, percentile, t-test statistics and chi-square.

More so, the research question one was answered using means scores and andard deviation. This methods were chosen because the questions will be nswered from the test result and they are the best methods which can revealed the fferent gap in the performance (mean score) and the degree to which these scores aried (standard deviation). Because attitude cannot be measured using raw scores, search questions two and three that are related to students attitude and therefore nswered using simple frequencies and percentile. The overall mean scores of the udents for both the impart of instructional material and the attitude of students ward instructional materials were used as a boundary for negative or positive titude and higher or lower achievement respectively.

Finally, hypothesis one was answered using t-test which is calculated based n raw scores to measure any difference exist and its significance between two roups. And it is best for hypothesis one. While hypotheses two and three were nswered using chi-square test. This was preferred because of the nominal nature f the responses gathered; hence attitude cannot be measured just through scoring. hat is why chi-square. Test is the most suitable method for testing hypotheses

two and three. However, summary of the analysis were presented on tables and figures to ensure effective communication. And the entire tests were carried out at a statistical significance of 0.05 levels of probability and n-1 degree of freedom.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Result presentation and interpretation.

4.1.1Interpretation of result to answer research questions:

Research question one:

To what extend does the use of instructional materials enhance achievement of students in Biology?

Table 1: Students' mean scores on the impart of instructional materials

Group	N	Mean Scores $(\bar{X})$	$(X-\bar{X})^2$	S.D
Experimental	50	14.7	228.1	5.03
Control	50	5.6	102.4	3.37

Experimental group with total mean scores($\bar{X}$):

$$\frac{6+8+12+13+14+16+18+20+20+20}{10} = \frac{147}{10} = 14.7$$

Control group with total mean scores($\bar{X}$): $\frac{0+2+4+4+5+6+7+7+10+11}{10} = \frac{56}{10}$

$$\bar{X} = 5.6$$

The results from table I show that, instructional materials enhance achievement in Biology. It can be clearly observed from the table students (respondents) from the experimental group have high mean scores of 14.7 and 5.03 standard deviation. While those from control group (that were taught without the use of instructional materials) have least mean scores of 5.6 and standard deviation of 3.37. This has shown that students that were taught using instructional materials have high possibilities of scoring 66% and above against their counterpart who were taught devoid of instructional materials, which may have high possibility of scoring 44%of the items which is below average.

Research questions two:

What is the influence of instructional materials on students' attitude towards learning Biology?

Table 2: Students' attitude based on responses.

	Attitude		
Group	positive	Negative	Total
Experimental	39	11	50
Control	12	38	50
Total	51	49	100

The table above has shown remarkable differences from the scores recorded on the two groups. The tool used on this table was the administered test on both the experimental and control group, where the students that were taught using instructional materials shows positive attitudes where by only 24% out of 100% students displayed negative attitudes towards instructional materials, on the other side 76% were positive and certain about the use of instructional materials.

Fig. 3: A pie chart for attitude/group distributions.

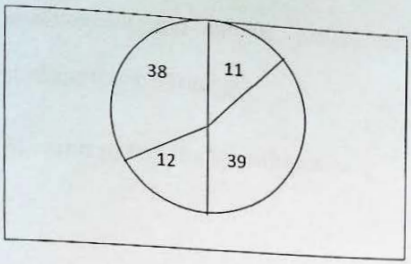


Table 2 results indicates that attitude of students is influenced by instructional material.

However, it is clearly presented and highly pronounced on the above pie chart; where result from experimental group with positive attitude occupied the wider spaced, followed by that from control group with negative attitude with a percentage frequency of 39 to 11 and 12 to 38 respectively. Having the percentage for experimental with positive and negative attitude and for control too positive with negative attitude respectively. The results with positive attitude having higher percentage frequency and closely followed by lower achievers with negative attitude. The narrow space indicates the least percentage group which is those with higher achievement and negative attitude. This result is clearly show the

nterdependency of achievement and attitude, hence, achievement influence/ letermine attitude of students toward Biology.

1.1.2 Interpretation of result to test the hypotheses

Hypothesis one:

There is no significant relationship between instructional materials and achievement in Biology.

Table 3: mean scores and t-values of students on impart of instructional materials

Group	N	$\bar{X}$	t-cal	t-tab
Experimental	50	14.7	51.75	2.920
Control	50	5.6	26.6	0.365

The result on table 4 shows that 51.75 is significance at p=0.05 level. This implies the rejection of hypothesis one, meaning that achievement in relation to instructional materials is significant.

Hypothesis two:

There is no significant relationship between instructional materials and attitude towards Biology.

Table 4: Observed frequencies for control and experimental groups.

	Attitude		
Group	Positive	Negative	Total
Experiment	38	12	50
Control	28	22	50
Total	66	34	100

Table 5: Expected frequencies based on the above hypothesis

	Attitude		
Group	**positive**	**Negative**	**Total**
Experimental	**30**	**20**	**50**
Control	**31**	**19**	**50**
Total	**61**	**39**	**100**

Table 6: Chi-square summary for Students' attitude

O	E	$(O-E)^2$	$(O-E)^2/E$
38	30	64	2.13
12	20	64	3.20
28	31	9	0.30
22	19	9	0.47
			6.10

X^2=6.10

Table 5 and 6 presented the observed and expected frequencies base on responses on the impart of instructional materials for the experimental and control groups. The chi-square (X^2) distribution summary on table 7 shows that X^2-cal is 6.10, with one degree of freedom. At 65 percentile, the X^2 – tab is 3.84, hence less than the X^2-cal (observed). Therefore, at 5% the observed chi-square is significant which suggest the rejection of null hypothesis, thus, instructional material seriously influence attitude of students.

Hypothesis three:

There is no significant relationship between achievement and attitude towards Biology.

Table 7: contingency table for observed frequencies of impart of instructional materials and attitude of students towards learning of Biology.

	Attitude		
Achievement	Positive	Negative	Total
Higher	37	13	50
Lower	17	33	50
Total	54	46	100

Table 8: expected frequencies on the basis of this hypothesis.

	Attitude		
chievement	positive	Negative	Total
igher	50/100x70=35	15	50
ower	35	15	50
otal	70	30	100

Table 9: x2 Summary on students' attitude based on achievement.

O	E	$(O-E)^2$	$(O-E)^2/E$
37	35	4	0.1
13	15	4	0.3
17	35	324	9.3
33	15	324	21.6
			31.3

$X^2=31.3$

This statistics would be approximately a chi-square distribution with 1 degree of freedom, which 95 percentile is 3.84. since, 3.84<31.3, the observed X^2 is significant at 5%, so the null hypothesis is rejected with the conclusion that, based on the information available, achievement of students extremely determine their attitude.

4.2 Discussion of findings on the result interpreted

4.2.1 Discussion of findings from the research questions

Research question one:

As interpreted during results presentation on the research question one, instructional materials has impart on achievement of students. It have been

observed, the greater differences in terms of performance on the mean scores and frequencies between students taught with instructional materials and those taught without. The result revealed up to 82% of students taught with instructional materials have high possibility scoring 60% and above of a given test items and up to 78% of those taught without have high probability of scoring less than 60%. As also indicated about 18% of students taught using instructional materials may have lower grade and 23% of those taught without may obtained higher grade.

Although, this is contrary to Adeniran (2006) findings; which revealed that the use of biology improvised instructional materials do not enhance achievement in Biology. But this may be nature and manner of approach adopted in the research, especially; he is dealing with improvised instructional materials which may not sometimes represent the actual model. However, students' age group, level of intellectual maturity, capacity may also play some roles in determining their performances. These and other factors may be interfering, but the controlled nature of their search minimizes their effects. Hence, the result agree with the findings of Osinem (2006), Okachi (2006), Maitafsir (2003), and Muhammad and Mango (2003), whose concluded that activity-based instructions enhance academic performance of students.

Research questions two:

What is the influence of instructional materials on students' attitude towards Biology?

Findings and discussion

The result in research question two revealed that, instructional materials promote attitude of students toward biology. Though Adeniran (2006) findings revealed that instructional materials neither enhance achievement of students nor promote their attitude, but geographical variation for the research may be the factor.

The result shows that about 77% of students taught with instructional materials usually have positive impart, while 23% may likely to have negative attitude. This is an evidence of the linkage between attitude and instructional approaches. On the contrary, result from the control group shows that approximately 50% have positive attitude and 50% negative. This may not be separated from other possible factors such as zeal from the student (from within), empowered by colleagues, or just responses to please their teacher, to boost the morale of their school, or through guessing due to lack of knowledge.

However, result from experimental group has judge the case, as revealed by Aggarwal (1994) attitude have direction, intensive, generality, and specificity, thus, it can be changed. The positive attitude for students taught with

instructional materials may be due to the intense nature it has which directs the students' attention specifically to it or due to influence from other factors, like logical presentation and productivity of teacher etc. the result is in line with Tileston (2004) and Kumar (2008) that posit instructional materials motivate students' interest and achievement which in turn promote their attitude.

The research questions three:

To what extend does achievement determines attitude of students towards Biology?

Findings and discussion.

In line with longbap (2006), which state that achievement and attitude are interdependent upon one another, the interpreted result from research question three has shown that attitude is determined by achievement. The result presented 48 students with high achievement and positive attitude against 33 with low achievement and negative attitude. Again, it presents 14 students with high achievement and positive attitude. It also indicated that there is high possibility of having higher achievers with positive attitude than lower achievers with negative attitude.

As pointed out by Erinosho (2008), the positive attitude most students have may be due to the pleasure they derived and the encouragement they

gained from higher achievement. As observed from the result, it cannot be wholly believe that all higher achievers should have positive, one reason or the other may warrant an exceptions, as observed in the result presented, about 20% of higher achievers have positive attitude, so also to lower achievers. However, it can be worrisome, but one's inner zeal and interest must play some roles.

4.2.2 Discussion of findings based on the hypotheses

Hypothesis one:

There is no significant difference between instructional materials and achievement in Biology.

Findings and discussion.

Instructional materials significantly enhance achievement in Biology. This result agrees with Osinem (2006), Kumar (2008) and Davis (2006) that firmly stressed that effectiveness and worthwhile result is highly dependent on appraisal and practical approaches adopt. Tileston (2004) also posit that most students are visual learners and about 98% of what is coming into the brain is through the senses. This result is however indicating that the influence of instructional materials on achievement of students is highly pronounced. This may be either due to the concretized effect of instructional materials used, elaborate explanation or logical.

Presentation of the concept, retentive ability (nature) of the method or the classroom condition which may make the knowledge to be permanent.

Hypothesis two:

There is no significant relationship between instructional materials and attitude towards Biology.

Findings and discussion

Findings from hypothesis two suggested that instructional materials extremely promote attitude towards Biology. The result indicated that influence of instructional materials on attitude of students is highly pronounce such that up to 80% and above of students that were taught using instructional materials may develop positive attitude towards the course, and less than 20% may have negative attitude. The positive attitude students have not been unrelated to the physical teacher-students interaction nature that characterized by the used of instructional materials. Even though, those that were taught without the use of instructional materials may develop positive attitude but this may not be detached from the other factor such as gender, nature of school, teaching method, condition of student maturity of students, and other class room conditions in which the students find themselves. The findings is in collaboration with Olaita and Agusiobo (1981)

which affirm that instructional materials stimulate interest and make learning more meaningful aand permanent, hence increase in performance.

Hypothesis three:

There is no significant relationship between achievement and attitude towards Biology.

Findings and discussion:

The result from hypothesis three interpreted allows the conclusion that achievement significantly influenced attitude. Although, there is possibility of having students with excellent result and negative attitude, but the probability is less. This shows that, achievement and attitude are extremely interlinked in such a way that, one can hardly exist without the present of the other. The result is in line with Aggarwal, (1994) Longbap, (2006), Aboyeji (2003), Adeniyi (2003) and Okachi (2006) who posit that attitude and achievement are highly interrelated.

Meanwhile, the positive attitudes higher achievers have may not be irrelevant to the pleasure they derived from the manipulative, sight and auditory nature/ effect of the instructional materials. As had been raised while discussing research questions, positive attitude may neither be solely dependent upon the use of instructional materials nor on higher achievement, other factors most also be considered. This is clearly observed in result presentations, that about 20% of

higher achievers have negative attitude and about 42% of lower achievers have positive attitude. Lower achievers develop negative attitude either due to discouragement from low performance or poor/ not understanding the subject at all. It cannot be concluded that all higher achievers have positive attitude, so there is exceptions, but keeping all other factors constant, the influence of achievement and instructional materials on attitude is extremely significant.

CHAPTER FIVE

SUMMARY, CONCLUSION, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDIES

5.1 Summary

This research was adopted experiment research design in exploring the influence of instructional materials on achievement and attitudes of secondary schools Biology students in Gombe metropolis. It was aimed at determine whether instructional material enhance achievement and promote attitude of students and whether achievement transformed attitude towards Biology. This was done (carried out) by administering questionnaires to two different groups of equivalent nature (status) after treatment of the selected topics. The independent variable was varied during the treatment, between the parallel groups(experimental and control). The major findings were as follows:

1. Instructional materials enhance achievement in Biology.
2. Attitude of students are influenced by instructional materials.
3. Achievement determines attitude towards Biology.

5.2 Conclusion.

Based on the information at hand, the use of instructional materials has significant influence over achievement and attitude of students towards Biology, hence

achievement significantly determine attitude towards learning Biology. The findings shows that, the use of instructional materials can extremely enhance achievement and promote attitude of students such that, higher grade would be obtained through fully participation. The students if instructional materials are properly used would score higher grade and develop interest in the subject, thus, act towards the subject. If the instructional materials are poorly used or not used at all, the students may end up scoring lower grade (poor result), hence hatred the subject and act away from it.

The effectiveness of instructional materials may not be detached from either the relevancy of the instructional material used, logical presentation of the instrument, teacher's productivity (proficiency) and level of subject mastery or the kind of instructional materials used in imparting the knowledge. As the matter of fact, making good use of instructional materials enriched the teaching-learning processes; increases the rate of skills acquisition and make learning more effective, meaningful and permanent.

5.3 Recommendations

1. Secondary schools Biology teachers in Gombe metropolis should as necessary equipped their teaching with adequate use of instructional materials and help

students to develop abstract skills and understand the importance of instructional materials through the use of laboratory and field work.

2. Parent should ensure and encourage the potentials of their children by adequate provision of relevant instructional materials to concretized their knowledge and skills gained.

3. Schools should provide all necessary facilities and laboratory equipment, and organize field trip that ensures maximum retention of abstract concepts taught during lesson.

4. Curriculum planners, developers and implementers should provide basic and necessary instructional materials for teaching Biology.

5. Other educational regulatory agencies should use these good opportunity and organize workshops, seminars, and enlightenments for Biology teachers on the good use of instructional materials.

5.4 Limitation of the study

Every successful work would be reliable/valid successful only if it encountered and overcome some prominent challenges and obstacles. Like all other successful researches this project encountered problems in the area of methodology and data collections. Even though, the sample size of 25% is enough for better and reliable result, the investigator compressed the content to be taught and time range for the

treatment, adopted post-test only experimental design instead of adopting pretest-post test which gives chance to assess students' initial capacity/knowledge and enable the researcher to understand whether the groups are equivalent or not. Some schools denied the researcher access to teach the concepts, complaining that they were about to cover the syllabus.

5.5 Suggestion for further studies

1. Similar research should be done in different geographical location or other field/area of study

2. Further studies should be made to find out the teachers' level of utilization and/improvisation of instructional materials towards Biology.

3. Further research should be made to find out the competency level of Biology teachers in the utilization of instructional materials.

4. Research should be carried out to investigate whether teachers' proficiency level and working experience enhance skillful utilization of instructional materials.

5. Further research should be made to explore whether the use of instructional materials stop delinquent act, school dropout, and other students' misbehaviors as absenteeism, bullying, making noise or wanting during lessons.

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THE RESPONDENTS LETTER

Federal College of Education (Technical)

Affiliated to University of Maiduguri

P.M.B 60, Gombe, Gombe State.

Dear respondent.

I am an undergraduate student of the above named institution conducting my research on the topic: The Impart of Instructional Material on Effective Teaching and Learning of Biology among Senior Secondary School Students.

Please, kindly respond appropriately to the items given. The information will only be used for the purpose of this study.

Thanks, for your kind cooperation.

ILIYA SALEH

2011/UG/BIO/00565.

THE STUDENTS' QUESTIONAIRE

PERSONAL DATA

Name of school:.....

Class:.....

Sex:.....

Age:.....

Date:.....

Part A: Impart of Instructional Material

SECTION 1

Tick the correct option that suit the statement below.

1. Teaching and learning process becomes easy with the use of teaching aid.

   True [ ] or False [ ]

2. Learning becomes real with the use of instructional material.

   True [ ] or False [ ]

3. Practical skills can be acquire with use of instructional materials.

   True [ ] or False [ ]

4. Instructional materials also fasting the rate of assimilation.

   True [ ] or False [ ]

5. The use of instructional materials promotes teaching and learning process.

True [ ] or False [ ]

SECTION 2

Cycle the right option from A-D that will correctly fill in the gab.

6. Instrument use to view microorganism is called.....

a. handle b. microphone c. microbes d. microscope

7. Microorganisms are minute living units commonly known as.....

a. Germs b. Microbes c. Protists d. Bacteria

8. The vectors microorganism-carrier transmits disease through.....

a. Salivation and vomiting b. grooming itself while working c. defecates on animals'host d. leaving body pick-up germs on dining table

9. ..... and .....are the indicators of present or absent of microorganisms in water.

a. Turbidity and cleanliness b. turbidity and transparency c. transparency and cleanliness d. turbidity and dirty

10. Vectors are animals that carry .....from one position to another

a. Pathogenic microorganisms b. pathogenic vectors c. disease d. dirty materials

PART B: STUDENTS' ATTITUDE SCALE

For each of the following statements indicate your opion by ticking [ ] the appropriate column; SA=Strongly agree, A=Agree, U=Undecided, D=Disagree, SD=Strongly disagree.

S/N	STATEMENTS	SA	A	U	D	SD
1	Biology is of no significance in secondary schools.					
2	Biology is very important to one's life.					
3	Biology is difficult to understand.					
4	Biology knowledge is based on fact, explaining our surrounding					
5	If properly used, biological knowledge ensures a good hygienic practice.					
6	Subject of Biology is very relevant in secondary schools					
7	Studying of Biology wastes time.					
8	Biology subject is the simplest subject.					
9	Biological studies do not improve any well bein or physical health of people.					
10	Biological knowledge has no practical implication.					

TABLE OF FORMULAE

INSTRUMENT	SYMBOL	FORMULA
Chi-Square	X^2	$\frac{(fO-fE)^2}{\sum fe}$
Mean	$\bar{X}$	$\frac{\sum fx}{\sum f}$
Percentile	%	$\frac{\text{No of responses}}{\text{Total no of respondents}} \times 100$
Standard Deviation	S.D	$\sqrt{\frac{\sum F[x-\bar{x}]^2}{\sum f}}$
t-test	t	$\frac{\bar{X}1-\bar{X}2}{s\sqrt{\frac{1}{N1}+\frac{1}{N2}}}$

CONTINGENCY TABLE OF RESPONSES FOR IMPART AND ACHIEVEMENT

Table 1: students' mean scores on the impart of instructional materials.

Group	N	Mean score ($\bar{x}$)	(x-x)2	S.D
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Control	50	5.6	102.4	3.37

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Total	51	49	100

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	Attitude	

Group	positive	Negative	Total
Experimental	38	12	50
Control	28	22	50
Total	66	34	100

Table 5: Expected frequencies based on the above hypothesis.

	Attitude		
Group	positive		Total
Experimental	30	20	50
Control	31	19	50
Total	61	39	100

Table 6: Chi-square summary for students' attitude.

O	E	(O-E)2	(O-E)2/E
38	30	64	2.13
12	20	64	3.20
28	31	9	0.30
22	19	9	0.47
			6.10

X2=6.10

Table 7: contingency table for observed frequencies of impart of instructional materials and attitude of students towards learning of Biology.

	Attitude	

Achievement	positive	Negative	Total
Higher	37	13	50
Lower	17	33	50
Total	54	46	100

Table 8: Expected frequencies on the basis of this hypothesis.

	Attitude		
Achievement	positive	Negative	Total
Higher	35	15	50
Lower	35	15	50
Total	70	30	100

Table 9: Chi-square summary on students'attitude based on achievement.

O	E	(O-E)2	(O-E)2/E
37	35	4	0.1
13	15	4	0.3
17	35	324	9.3
33	15	324	21.6
			31.3