EFFECTS OF CONTINUOUS ASSESSMENT ON ACADEMIC ACHIEVEMENT OF NCE CHEMISTRY STUDENTS IN KADUNA STATE

BY

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DECLARATION

I declare that the thesis entitled – "Effects of Continuous Assessment on Academic Achievement of NCE Chemistry Students" has been written by me in the Department of Education, Science Education Section under the supervision of Dr. J.S. Mari. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any university.

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CERTIFICATION

This thesis entitled EFFECTS OF CONTINUOUS ASSESSMENT ON ACADEMIC ACHIEVEMENT OF NCE CHEMISTRY STUDENTS IN KADUNA STATE by Muhammad Binta Asabe meets the regulation governing the award of Masters Degree in Science Education, Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This thesis is dedicated to my parents, husband and children for their love, concern, moral and financial support.

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First and foremost I would like to express my profound gratitude to Almighty Allah (SWT), the Mighty through whose mercies I was able to undertake this study. I also wish to express my sincere gratitude and appreciation to my major supervisor in the person of Dr. J.S. Mari for his in-depth analysis, guidance, scholarly advice and cooperation. In fact he has left an indelible mark in my educational pursuit. I am equally indebted to my second supervisor in the person of Dr. S.S. Bichi whose assistance to me is also instrumental to the successful completion of this study.

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ABSTRACT

The study was undertaken to investigate the effects of Continuous Assessment on academic achievement of NCE chemistry students in Kaduna state. The population of the study comprises of all chemistry students in colleges of education in Kaduna state. The sample consisted of 90 chemistry students drawn from the colleges of Education in Kaduna state. A pre-test post-test experimental control group design was used. The experimental group was further divided into two groups, E_1 and E_2, while only one group serves as control group. The experimental group EI was subjected to two sets of Continuous Assessment while E_2, the second experimental group was subjected to four sets of Continuous Assessment and finally the control group C was left without any Continuous Assessment.

Pre-test and post-test were administered to the three groups. Five hypotheses were stated. Two instruments, teacher made test (T.M.T) was used for the Continuous Assessment and Organic Chemistry Test (OCT) was used as both pretest and post test. The data obtained were analyzed using F-test, ANOVA, t-test, and Pearson product moment correlation coefficient (r) statistics at 0.05 level of significance. The findings of the study revealed that:-

- Continuous Assessment has significant effect on academic achievement of NCE students.
- There is no significant difference in the achievement of male and female students when exposed to fewer C.A's.
- There is significant difference in the achievement of male and female students when exposed to many C.A's.
- There is no significant correlation between C.A scores and final examination scores of NCE chemistry students.

In the light of the findings from this study, it was recommended that chemistry teachers should strive to see that at least four C.A's are given to students per semester in order to improve their academic achievement and that teachers should also be properly trained on the methods and techniques of Continuous Assessment construction and administration for the system to be effective.

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ABBREVIATIONS USED

In the course of this study some words have been abbreviated and frequently used in the text. The abbreviated words are outlined as follows:

T.M.T	-	Teacher Made Test
OCT	-	Organic Chemistry Test
W.A.E.C	-	West African Examination Council
C.A	-	Continuous Assessment
N.T.I	-	National Teachers Institute
G.C.E	-	General Certificate of Education
C.S.E	-	Certificate of Secondary Education
G.C.S.E	-	General Certificate of Secondary Education
U.S.A	-	United States of America
S.S.C.E	-	Senior Secondary School Certificate
J.A.M.B	-	Joint Admission and Matriculation Board
N.C.E	-	National Certificate in Education
W.A.S.C	-	West African School Certificate

CHAPTER ONE
THE PROBLEM

1.1 Introduction

Examinations and assessment are an integral component of our educational structure. They are conducted both formally and informally, at practically all levels of education and serve a variety of different functions. In the narrow sense, examinations and assessments may be thought of as having predominantly educational purposes. They may be used in order to:-

- Assess students' attainment at the end of a course or study programme.
- Evaluate diagnostically students' academic achievement, progress and/or learning difficulties.
- Evaluate students' aptitude, possibly for the purpose of assigning them to different courses or teaching set.
- Evaluate the effectiveness of an educational programme or curriculum.

(Richard, 1999)

Most of the examinations and assessments regularly conducted by teachers and schools on an 'internal' basis tend to fulfill one or more of these educational functions. Other examinations for example, those conducted 'externally' by the recognized examining boards and certain professional associations, likewise have a primary educational purpose: to assess the attainment of a student at the end of a course of study. The primary assignment of any school is to ensure effective teaching and learning of which assessment and examination a form of evaluation, plays a significant role especially in decision making about school programme (Ijaya, 2002). Assessment in education in general is essential and is an on going

process. It is the basis for all educational activities. Assessment information is a vital tool in the hands of the professional teacher. It directs guides and protects both the teacher and the learner at every stage of academics (Okwudire, 2005).

Continuous Assessment process is an important component of the National Policy on Education (FME, 2004). This system of assessment and evaluation is an innovation in the Nigerian educational system which has its genesis from the first national curriculum conference held in Ibadan in 1969. The outcome of that historic conference were published, a high powered committee consisting of educationist, university academics, civil servants, industrialist and intellectuals from various works of life was set up to study the report in depth and present recommendations based on its formulation into a new National Policy on Education (FME, 1977).

In 1977, an implementation task force was set up to prepare a blue print for the implementation of the new policy. Input into the Federal Task came from various state task forces set up for the purpose. The Federal Government White Paper on the implementation task force came out in 1979 and constitutes the basis of what is now the new National Policy on Education (FME, 1998). One of the distinct features of the new National Policy on Education is its emphasis on Continuous Assessment. According to an extract from the National Policy on Education (FME, 1998) "Educational assessment and evaluation will be liberalized by basing them in whole or in parts on Continuous Assessment of the progress of the individual." The clearest statement as to how the desired 'liberalization' was to be achieved was stated in the National Policy on Education. And the type of education that will bring about self realization, better human relationship, national consciousness and technological progress in Nigeria (FME, 1998).

The new National Policy on Education in Nigeria has directed that Continuous

Assessment should be used at all educational levels for the evaluation of student achievement. This means that every teacher from primary school to university should understand and practice it. Before the implementation of Continuous Assessment, the summative system of assessment was used where students will be assessed at the end of the term without including any other form of assessment, and this form of assessment is used to evaluate students achievement for placement and promotions to upper class. Mock examination was conducted prior to WAEC examinations. This result was often used to determine those students that qualify to write the final examination (WAEC) and also to secure provisional admission into higher institution before the release of WAEC result (Ango,1997). Carew(1985), stated that irrespective of how well a student's performance is during his/her years of schooling, if his/her performance in the summative type of examination is not good, he/she is considered incapable of advancing further in education.

Dodo (1985) maintained that "there are even few cases of suicide from failure in final examination". In view of the above reasons, schools and colleges adopted the Continuous Assessment system. The Federal Government of Nigeria stressed the need and importance of Continuous Assessment in relation to examination. It was stated in the National Policy on Education (FME, 1998) that there is the need for Continuous Assessment for the integration of all types of evaluations. Continuous Assessment therefore, represents a continuing awareness of the development of the pupil over a period of time and the general building of cumulative judgment. Continuous Assessment also referred to as "process evaluation" does not only measure advancement but also indicates the progress towards it. In science, especially chemistry, assessments should seek to measure

the particular qualities that a curriculum or course seeks to foster in students. In the context of science (chemistry), such qualities may be divided into three broad categories outlined below according to Richard (1999):-

1. Intellectual abilities and skills that include the student's ability to recall, apply, evaluate scientific information and to plan and device experimental investigations for the solution of scientific problems frequently. Abilities of this nature are referred to as cognitive abilities.
2. Manipulative skills and abilities that include skills in the handling and manipulation of materials and apparatus in the context of scientific investigations, as well as ability to follow instructions and to make accurate observations. Generally these and related skills are referred to as psychomotor skills.
3. Qualities that concerns students attitude and interest in science and the study of science and science related beliefs and values, as well as ethical judgments and interpersonal relationships. Qualities of this nature are generally referred to as affective characteristics: The influence of gender on the learning ability, interest and achievement of students cannot be overemphasized. Results of several researches conducted over the years revealed that there is significant difference in students' choice of subject as well as their performance in science and non-science subjects. Olarewaju (2004) reported a significant difference between boys and girls achievement in the knowledge of biology concepts. Boys in this report were found to achieve better than girls. Dahiru (2004) also conducted a research to determine if gender is a factor in the selection of science subjects in Katsina Local Government Area. His result revealed that gender is not a factor in the selection of science subject in Katsina local

government.

Adeqive (2000) attributes difference in learning ability of boys and girls to socialization process as girls are denied out of school and pre-school experience in problem solving especially those involving visual activity behaviour that inhibits the development of mathematics and science capability in girls. This research therefore, intends to provide equal opportunities for both boys and girls in the teaching and conduct of Continuous Assessment.

Academic achievement in science (Chemistry) is viewed in different ways by different authors; depending on the context in which it is viewed. Generally, achievements means accomplishment or exhibition of proficiency in a given skill or body of knowledge. Amuset (1994) viewed academic achievement as the knowledge obtained or skill developed in the school subject usually designated by test score or by means assigned by the teacher.

However, Okebukola and Jegede (1986) subdivided achievement into three categories. These are:

a. High achievers (top 75%)

b. Medium achievers (middle 55%)

c. Low achievers (bottom 25%)

Academic achievement, according to Musa (2000), refers to the quality of results produced by students as reflected in the quality of their examination scores. If more C.A is given, it means more motivation on the part of the students and it is hoped that the achievement will increase. Continuous Assessment is often used to motivate students to learn. According to Beard and Seniour (1980), motivation is understood by the teacher as "the urge to work independently either applying one self to his work, interest in ones task or course he has chosen, the desire for a good

qualification and good employment, determination to pass examination or a defined goal which one has set for himself and sustenance of enthusiasm".

This study therefore, intends to find out if students given more number of Continuous Assessment per semester will perform better in the final examination than those who are not given. The study also investigates whether there is any difference in the achievements of male and female students exposed to Continuous Assessment. And finally, the study intends to finds out if there is any relationship between Continuous Assessment scores and final examination scores of NCE chemistry students.

1.2 Statement of the Problem

Science educators have advocated the need for Continuous Assessment as an integral part of science evaluation programme (Hambury, 1995). However, there is no empirical data to support the effectiveness of the Continuous Assessment system in promoting learning and to show whether or not the performance of students will increase on exposure to more C.A. As C.A has potency to motivate learners to learn. Vroom (1984) defined achievement as a product of motivation and ability. According to him behaviour is not only just influenced by ability but also by how much the individual wants to do certain events and by how much they expect they will do it. So when students are being examined they are motivated to work hard. Therefore, the problem of this study is to find out if exposure of students to many Continuous Assessments has significant effect on the final examination. More assessment means more motivation and thus better achievement, but sometimes human behaviour may change. Many assessments may mean more stress on the part of the student.

In some studies it is shown that there are gender-related differences in learning (Jegede, 1989 Mari, 1991 and Ajagun, 1998). This research uses the two

gender and gave them same teaching and assessment techniques, so adequate step is taken to remove any gender difference in the administration of the treatments. This research work also tries to find out if gender has any effects in the administration of Continuous Assessment to students.

What is not known conclusively is the consistency of Continuous Assessment scores to examination scores. Odili(1995), in his study, asserts that some Continuous Assessment scores are not consistent with examination scores since they show little or no significant correlations. Ihiegbulem(1994), however, found out that a substantially high and significant degree of positive relationship exists between Continuous Assessment and examination scores. One of the purposes of this study therefore, is to determine whether there exists a relationship between Continuous Assessment and examination scores. There is the problem of correlating Continuous Assessment with actual examination scores for instance; it is not uncommon to find a student having very high score in continuous assessment and extremely low score in the final examination (Hassan, 1987). It is hoped that the results from this study will clarify all the stated problems.

1.3 Research Questions

In view of the above, the following research questions were formulated to guide the conduct of the study.

(1) What is the effect of frequent administration of Continuous Assessment on academic achievement of N.C.E chemistry students?

(2) To what extent do male and female students exposed to two sets of Continuous Assessment differ in performance in the first experimental group?

(3) To what extent do male and female students exposed to four sets of Continuous

Assessment differ in performance in the second experimental group.

(4) Is there any relationship between Continuous Assessment and final examination scores of NCE chemistry students exposed to two sets of Continuous Assessment in the first experimental group?

(5) Is there any relationship between Continuous Assessment and final examination scores of NCE chemistry students exposed to four sets of Continuous Assessment in the second experimental group?

1.4 Null Hypothesis

The null hypotheses formulated for the study are:

HO: 1 There is no significant difference in the mean academic achievement scores of students exposed to Continuous Assessment and those assessed using final examination only in chemistry.

HO: 2 There is no significant difference between the mean academic achievement scores of male and female students exposed to two sets of Continuous Assessments in chemistry (that is the first experimental group E_1).

HO: 3 There is no significant difference between the mean academic achievement scores of male and female students exposed to four sets of Continuous Assessments in chemistry (that is the second experimental group E_2).

HO:4 There is no significant relationship between the mean Continuous Assessment scores of N. C.E. students exposed to two sets of Continuous Assessment in chemistry (that is the first experimental group E_1).

HO: 5 There is no significant relationship between the mean Continuous Assessment scores and final examination scores of N.C.E. students exposed to four sets of Continuous Assessment in chemistry (that is the second experimental group 2).

1.5 Objectives of the Study

In view of the above, the study is geared towards achieving the following objectives:

1. To determine the effect Continuous Assessment has on final examination scores of N. C. E. Chemistry students.
2. To find out if male and female students exposed to Continuous Assessment differ significantly in academic achievement.
3. To investigate if there is any relationship between Continuous Assessment scores and final examination scores of N. C. E. Chemistry students.

1.6 Significance of the Study

The main aim of an academic research is to add to the existing knowledge due to the fact that problems are identified and solutions are provided, hence improvement is always expected. The result of this research therefore, is expected to provide an insight on the sustainability, applicability and effectiveness of Continuous Assessment in colleges of education N.C.E programmes. Continuous Assessment is administered at every level of education from primary schools to university; however there is no empirical data to support its effectiveness in enhancing performance. This research is of significance to the teachers, as it will provide empirical data that would show the number of Continuous Assessment that could be administered in a semester to give optimum performance by students. It will also provide teachers with skills and techniques in organization and administration of Continuous Assessment. There are sampled C.A questions which would serve as a guide for further questions.

Teachers always seek for a Continuous Assessment score that correlate very high with final examination so that the performance of the students in the final examination can be predicted. This will enable them to identify C.A mean score that would provide a more reliable feed back that could be used to predict students' grades

in the final examination. The teacher would also be better positioned to provide parents with a very reliable feedback of the students' performance in school. The C.A that correlates more is the most reliable and will predict the final performance of the students and when passed to parents it gives more reliable feedback. To curriculum planners this research will help to determine the number of C.A to be inserted when designing the curriculum.

Undoubtedly, the study findings will help lecturers, policy makers and educationist to decide on the effectiveness of the Continuous Assessment process furthermore, it is hoped that the result of this study will make an enormous

Contribution to the existing literature in the area of Continuous Assessment.

1.7 Scope of the Study

The study is delimited to Colleges of Education in Kaduna state namely F.C.E, Zaria and F.C.E Kafanchan. The two colleges were chosen

Due to the fact that they are the only two Colleges of Education in Kaduna state, and they are all affiliated to Ahmadu Bello University, Zaria as the moderating institution. Thus, the standardization and quality of their programmes are under control. The findings of this study are generalizable only in these colleges.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The concern of this study is to investigate the effect/role Continuous Assessment plays in enhancing academic achievement among N.C.E. Chemistry students. In this chapter, literature related to the study is reviewed. Specifically, the chapter is presented under the following subheadings:

- The concept of 'assessment' in education.
- Philosophy, principles and practice of Continuous Assessment in Nigeria.
- Continuous Assessment and achievement.
- Characteristic features of Continuous Assessment.
- Methods and techniques used in the administration of Continuous Assessment.
- Summative system of assessment or evaluation.
- Teachers' role in the administration of Continuous Assessment.
- Gender related difference in achievement in science.
- Continuous Assessment worldwide.
- Review of related studies on Continuous Assessment and academic achievement.
- Summary of literature reviewed.

2.2 The Concept of Assessment in Education

Understanding the concept of Continuous Assessment makes implementation easier. To some, it means a summative 'mark' or score added to the final examination to certify students; some believe it to be a diagnostic and formative evaluation of student's learning (Ango, 1997). According to Nitko (1994), assessment is the

process of gathering information for the purpose of making decisions about education policy, curriculum programmes and about individual students learning. It refers to the process of gathering relevant information. F.M.E. (1985) pointed out that Continuous Assessment is the mechanism whereby final grading of students in the cognitive, affective and psychomotor domains of behaviour systematically take account of all performance during a given period of schooling, such an assessment involves the use of a great variety of modes of evaluation for the purpose of guiding and improving the learning performances of students.

Assessment is however a means to an end, not an end in itself. It serves several purposes particularly in decision making whether at primary, secondary or tertiary level (Ijaya, 2002). Assessment refers to systematic collection of data and gives information about individual, (Okwudire, 2005). Continuous Assessment is classroom strategy implemented by teachers to ascertain knowledge, understanding and skills attained by pupils. Teachers administer assessment in a number of ways over time to allow them to observe multiple tasks and to collect information about what pupils know, understand and can do. These assessments are curriculum based tasks previously taught in class. [Lewis, 1997).

Yoloye (1984), described Continuous Assessment as a method of evaluating the progress and achievements in educational institution. Yoloye's view aims at getting the truest possible picture of each student's ability and at the same time help each student to develop his or her abilities to the fullest. It is a method whereby the final grading of students considers in a systematic way their whole performances during a given period of schooling. The view expressed by Yoloye, shows that Continuous Assessment is progressive in terms of evaluating the resultant changes in the behaviors of the learner based on his or her academic

achievement, character development and manipulative skills. This method of assessment is in contrast with the former method of assessment, which is narrow because it only assesses the intellectual progress of the students.

Bajah (1984), views Continuous Assessment as the continuous updating of judgment about performance in relation to specific criteria, which allows at any time a cumulative judgments to be made about performance of these same criteria. This view indicates that certain basic criteria must be present before any assessment can be effectively carried out.

Ezenwa and Okoye (1981), defined Continuous Assessment as a systematic and objective process of determining the extent of a student's performance in all the expected changes in his behaviors from the day he started a course of study in a continuous and progressive manner to the end of such a course of study and a judicious accumulation of all pieces of information derived for this purpose with a view of using it to guide and shape the student in his learning from time to time and serve as a basis of important decisions about the students. In effect, Continuous Assessment is seen as a systematic and objective method of determining the extent of a student's performance in all the expected changes of his behaviours throughout the course of study.

Denga (1983) stated that Continuous Assessment means total evaluation of the pupils on the basis of their curriculum and non-curriculum activities, which is in and outside the school. Denga's view means students are evaluated on the basis of planned and unplanned activities within and out of the school system. This provides the true assessment of the pupils' academic and non-academic achievements. Examination is not always the true test of one's ability. This is more so in a situation where the examiners are subjective in their judgments or when the students' are

faced with one problem or the other during the time of examination. The only remedy to such situation is to have various assessments covering the three essential domains; that is cognitive, affective and psychomotor.

Hassan (1994), reported that Continuous Assessment is a systematic collection of marks or grades over a period of time and its aggregation into a final grade. Hassan's view gives the classroom teacher the scope to make use of variety of assessment techniques appropriate to the subject being offered by the students. Such procedures include practicals, projects and fieldwork. All these have their place in the scheme of Continuous Assessment as grades and marks will be awarded on the basis of achievement in each of the methods used for determining the student's performance.

Turton (1983), stated that Continuous Assessment is not only the recording and compilation of data, but assessment of the progress of the students which is immediately linked to the instruction they have been given in an attempt to change the behaviour of the student. It includes an in-built mechanism and innovations such as the instructional methods needed by the teacher for his own improvement of teaching. Turton's view enhances learning by the students since assessment involves the use of a variety of modes of evaluation and improving the learning and performance of the students. Andrew (2000), viewed Continuous Assessment as a means of indicating the progress or maturation of the student but it is also used especially for detecting problems. It is therefore, in the interest of the teacher to administer some form of assessment on a continuous basis on his students to evenly cover the material he is teaching.

2.3 Philosophy, Principles and Practice of Continuous Assessment

In the new National Policy on Education, (1998), it was stated that; "educational assessment and evaluation will be liberalized by basing them on Continuous

Assessment of the progress of the individual". The above statement is amplified in subsequent sections dealing with primary school education, secondary school and also in the administration and planning of education. The policy stated that Primary School Leaving Certificates should be based on Continuous Assessment results. Selection into secondary schools was to be based on Continuous Assessment and examination results of students. The Senior Secondary School Certificate Examination was to be based on National Examination. In Teacher's Colleges, Continuous Assessment based on a variety of techniques was to be used. The tertiary level and other institutions of higher learning were to introduce Continuous Assessment into their final grading. To ensure the maintenance of common standards, Continuous Assessment would be coordinated by schools, the Universities the Ministry of Education and the West African Examination Council (WAEC). These organizations were expected to meet and work out a common scheme.

Ipaye (1982), advised that to carry out the scheme planned by the Federal Government effectively in the National Policy on Education, the daily performance of students should be regularly graded and summarized and reflected in the term summaries. Ipaye made the following recommendations:

- The end of term scores was to be added to the term summaries to give a record of academic achievement of the term.
- The combined scores were to be used on academic and behavioural achievement that is (cognitive, affective and psychomotor) domains, this will form the Continuous Assessment for the student for the term and this process should continue.
- The overall summary for the year was to be calculated from the term scores, the work for each term contributed to the entire year's work. The cumbersome nature of work involved in the process of Continuous Assessment

> demanded a combined effort of teachers', principals, heads of departments, guidance councilors and ministries of education.

Ipaye did not state where the materials for the assessment were to be obtained and how to train teachers to handle the work.

Yoloye, et al (1980), in their recommendations stated that teachers were expected to shoulder the major responsibilities for Continuous Assessment since teachers' were closer to the students' and as a result they stood a better chance of assessing the overall development of students' in and outside the classroom. His work is related to this study in the sense that he recommended that teachers role in the assessment of students', which has led to record keeping of Continuous Assessment and examination scores by the teachers'. Their works also fail to recommend the training of teachers and the optimum number of Continuous Assessment instruments that should be given. F.M.E. (1985), pointed out that the rationale for advocating Continuous Assessment is as follows:

a. Assessment is an integral part of the teaching - learning process. It is therefore reasonable that the teacher should be involved in the final assessment of the pupils he/she has taught. The teacher is denied the final assessment of the students if a single examination is set by an external body,
b. The Continuous Assessment system enables the teachers' to assess their instructional methods from time to time in order to improve their performance. The data from Continuous Assessment provides a feedback to the teachers on the effectiveness of their instructional strategies.

2.4 Continuous Assessment and Academic Achievement

In the Nigerian educational system, two sets of assessments are used to

evaluate the level of student's achievements. These are the Continuous Assessment (periodic course assessment) and the final examination assessment. This replaced the one short system of assessment, which was observed to have several shortcomings (Michael and Odenu, 1994). Some of the shortcomings are lack of diagnostic and guidance oriented properties, creation of emotional problems, low context coverage and high rate of examination irregularities. According to Danjuma (2004), Continuous Assessment in the educational system serves several purposes, which include the following:

i. To provide more valid and reliable assessment of the student overall ability
ii. To enable teachers' to be more flexible and innovative in their teaching,
iii. To provide basic guidance for students,
iv. To reduce examination malpractice.

The Continuous Assessment policy requires that students' be assessed through both Continuous Assessment and terminal assessment to evaluate the progress and growth of students. The practice is further given a boost in the Colleges of Education Evaluation System by the requirements of the National Commission for Colleges of Education.

Odile and Ajuar (1995), asserted that Continuous Assessment takes account of all the child's performances in tests, assignments, projects and other educational activities during a given period of term, semester, year or during the entire period of an educational level. Teachers' often take crucial decision on the promotion of students to the next class, identification of students who need remedial help and for grading and certification of students. Therefore, Continuous Assessment directly affects students achievements, that was why the Federal Ministry of Education, Science and Technology trailing the same pathway of this

exercise of Continuous Assessment and encouraging its practice observed that assessing the teaching/teaming process is an integral part of the curriculum in which the teacher must be fully involved. He further observed that it is an all embracing exercise, which the learner should undergo throughout his schooling period.

Continuous Assessment is therefore, a way of obtaining the most value assessment of the capabilities of a student. This is because it is an aggregate of all the achievement of a student from the beginning of the course to the end of it, which determines the final achievement.

2.5 Characteristic Features of Continuous Assessment

Based on the concept of Continuous Assessment, it has many characteristics such as:

SYSTEMATIC: Continuous Assessment is said to be systematic in the sense that it requires an operational plan, which indicates what measurements are to be made of the student's performance or at what time interval, or times during the school year, the measurements are to be made and the results recorded, the nature of the instrument and tools to be used for the measurement. Ughamadu (1994), stressed that the systematic nature of Continuous Assessment is that its operations requires the working out in advance, a definite programme of the assessment. Thus, an operational plan that indicates or specifies what measurements are to be made, of the students achievement, the time interval when such measurements are to be made, the results recorded and the specific nature of instrument or strategies to be adopted for the measurement are usually decided in advance. This research is aimed at finding out the systematic nature of Continuous Assessment whether frequent administration of Continuous Assessment per semester will yield better

achievements or not.

Ipaye (1982), stressed that Continuous Assessment is systematic only when the varieties and types of the assessment to be used are specified in advance for the students to know, the students should be, aware of how frequent the Continuous Assessment should be whether on weekly basis or monthly at the end of the semester, he also stressed that students should know who is to be involved in the Continuous Assessment administration especially the teacher. Ipaye's view of the systematic nature of Continuous Assessment is in line with this research. Turton (1983) opined that Continuous Assessment should be planned and be periodic. This indicates that whatever is going to be used in the measurement of the students' achievements such as test - items and instruments should be well planned and the assessment should be made at intervals. This makes Continuous Assessment systematic.

COMPREHENSIVE: This has to do with a variety of instruments or assessment procedures used in ascertaining the achievement of students. Bloom (1986) and Ughamadu (1994), stated these instruments to include tests, assignments, questionnaires, interviews, sociometric technique checklist and inventory used in Continuous Assessment system.

Therefore, Continuous Assessment is comprehensive because it does not only measure outcome of the instruction in terms of achievement, it also measures other aspects like the affective and psychomotor domains.

CUMMULATIVE: This occurs when the results of Continuous Assessment are recorded in a progressive manner showing trends and growth pattern over time, each data added on to the previous one and subsequent ones in a given ratio. The fate of the students' lie with the teachers that assess them and are responsible for

keeping up to date records of the students achievements. Hassan (1994), stressed that scores are added from the first term through the second to the third term and are considered for grading with the final examination scores for either promotion to the next class or for graduation. Danjuma (2004), pointed out that two sets of assessments are used to evaluate the level of students' achievements. These are the Continuous Assessment (periodic course assessment) marks, which is cumulative and the final examination marks. When two, three or four tests are given in a semester, the scores should be added up to make the final Continuous Assessment, thus making the Continuous Assessment score to be cumulative.

GUIDANCE ORIENTED: Guidance oriented Continuous Assessment stressed that areas of students strength and weakness should be communicated to the students to enable them make adjustments. Aliyu and Ngadda (2000), examined that periodic assessments are very effective measures of academic achievements. Turton (1993), opined that guidance oriented Continuous Assessment shows greater validity of the process of Continuous Assessment because of the involvement of the classroom teacher in the assessment procedure. Guidance oriented Continuous Assessment indicates that information obtained is used to guide the students further development. In other words, information obtained from planned and frequent administration of the variety of tests in a Continuous Assessment practice can be very useful in guiding the students in the right part of learning not only in the cognitive but also in the affective and psychomotor areas.

DIAGNOSTIC: Another characteristic of Continuous Assessment is the diagnostic function. Ohuchi (1988), states that there are many uses for which assessment data scores may be put in our present system of education. Assessment for placement and/or certification is highly appreciated in Continuous Assessment, which serves

as feedback to both teachers and students. It offers the opportunity of taking corrective actions whenever any undesirable trends are observed.

PROGNOSTIC: This aspect of Continuous Assessment looks into the future and predicts how well the student will perform on similar tasks or even completely different task in future (Nwaze, 1998).

FORMATIVE: Ezenwe (1992), observed that the objective of formative assessment is to enable the students to monitor his progress and with a view to identify his learning problems and correct them.

SUMMATIVE: This type of assessment is given at the end of the term, semester or years. It is mostly concerned with decision-making at the end of the term, semester or end of the year and such decision takes into account the results of the formative assessment. Turton (1983), added five practical characteristics to school based Continuous Assessment and these include:

- **Simplicity:** This aspect stressed that Continuous Assessment should be simple in both design and operation. It stressed that any new idea to be introduced into the institutional setting has to be simple at the on set, the refinement could be later.

- **Comprehensibility:** In this aspect Continuous Assessment data or scores should be in form of what can be easily comprehended by all concerned one of the aims of the system is to communicate present information to the students. Comprehensibility is achieved through the adoption of a system of grading based on ranking students in order to merit within a particular year or group for each subject.

- **Security:** The security of Continuous Assessment is expressed in two areas namely; the physical security aspect and the security against forgery and misuse. Records of students had to be physically secured against natural hazards such as fire, rain and theft.

- **Validity:** This includes the content and face validity (that is, internal and external) within the institution and Continuous Assessment ensures internal consistency of results. Externally, it is affected by the system of moderation

- **Integrity:** In this aspect, integrity is promoted within the system through making reasonable demands on the teachers in terms of training and materials. Well design forms of data recording and ensuring an equitable distribution of the extra work, which Continuous Assessment entails are equally important.

2.6 Methods and Techniques Used In the Administration of Continuous Assessment

Continuous Assessment is mainly teacher-oriented, that is why in some countries Continuous Assessment is referred to as "teacher assessment F. M. E., (1985). Detailed guidelines on how teachers should conduct Continuous Assessment are outlined, no single assessment tools may be adequate to measure all changes in behaviour or the objectives of a lesson. The objectives of a lesson have been categorized into three broad areas called domains. These are the cognitive domains, the affective domain and the psychomotor domain. The cognitive domain is concerned with knowledge and its use. The affective domain deals with emotional responses such as interest, appreciations, attitudes, feelings and values that one may attempt to

teach through the lessons. The psychomotor domain is concerned with physical, motor and manipulative skills (NTI, 2006).

a. **TEST:** The major and the most useful instrument for the assessment of cognitive behaviour, which are tests, are written down questions to be answered by students. According to Nitko (1994), testing and examining are the most formal assessment methods. Learning experience is represented by qualitative marks. It could come in the multiple choice or essay form, which students are expected to answer, it is their responses to the questions that give the measure of the level of achievement or performance. Measurement is the process of assigning the marks.

b. **ROJECTS:** This is another instrument used for measuring achievement. Projects can be used for the measurement of achievement in the cognitive affective and psychomotor domains according to Barclay and Breheny (2001); "project work involves collection and analysis of data, engaging in open-ended experiments. Identifying and endeavoring to solve problems in fields of learning and investigation underlying concepts and principles." Some projects may span over a month, a term, a semester or a year.

c. **ASSIGNMENTS:** These are specific tasks meant to be completed within a short time. They are usually meant to reinforce a previous lesson or to prepare for a forthcoming one. According to Ango (1997), assignments provide students the opportunity to practice an independence work. The objective of assignment must be stated, and then assignment will follow the same procedure as for other written works.

d. **OBSERVATION:** This is a very important procedure for psychomotor and affective domains. The teacher can learn a lot about the child's interest,

attitude and ability to accomplish a particular task through observation. It is a technique of gathering information; the teacher will be better disposed to include such information in the students' report. F. M. E (1985) pointed out that the technique has the advantage of giving a record of actual behaviuour of the child, which would be free from teacher's bias interpretation.

e. **CHECK LIST:** Check list consist essentially of the listing of steps, activities, behaviours or statement associated with a given behaviour traits that observer records when incidents occur. With check list, a teacher can determine whether or not a particular behaviour trait or characteristics are present or absent. Checklist can be utilized effectively in assessing affective and psychomotor behaviour. A checklist consist of list of things or statements, which pupils are expected to respond to by marking/ticking those that apply under the stated situation and leave unmarked those that do not apply. Example, reading checklist rate pupils using always; sometimes, never. Example, love story books - spends time with books, narrates stories from books. Checklist may also outline a particular procedure for carrying out a particular operation (NTI, 2006).

f. **INTERVIEW:** This technique provides for direct observation, the student is confronted by the observer, councilor or teacher and this confrontation could result in students being more cautious in the way they answer questions than they will normally be. According to Nwaeze (1998), interviews may be either structured or unstructured. In the structured interview, the interview schedule, which contains set of questions to be asked in specific order are used. The answers are written down or recorded while in the unstructured interview, the order and the exact form of the questions are not specified but the general

idea of what is expected is known by the interviewer. The interviewer encourages the interviewee to expand on his answers by asking leading questions.

g. **QUESTIONNAIRES:** Questioning people orally in a formal situation make them anxious. They may be worried about why they are being questioned, what they are expected to say and how their responses will be interpreted. While these are completely absent when you use questionnaire. The threat often inadvently associated with interviews is not there. Questionnaires are instruments that present information to a respondent in writing or through the use of pictures and then require a written response, a tick, a circle, a word, a sentence or several sentences. (NTI, 2006). According to Emmanuel (1993), questionnaires can be structure or open-ended. In the structured questionnaire, the respondent is required to select one or more responses from alternatives. The open-ended format gives the respondent freedom to answer in his own words. Teachers can get information relating to students' attitude, interest, studying habits and personal characteristics with the use of questionnaire. A questionnaire may be made up of statements in the affirmative, which can be agreed or disagreed with. A questionnaire may also be made up of incomplete statements that the student is expected to complete. Questionnaires can serve a number of useful purposes in the classroom, if carefully designed.

h. **RATING SCALE:** This is another type of question one may find in a questionnaire. This type requires the student to say how much he agrees with a statement, for example; My classroom is the neatest in the school.

…… …… ……

Disagree Not sure Agree

The student will put a mark in the space, which tallies with the way he feels. This type of questions rate, so the instrument is rating scale. (Nwaeze, 1998).

i. **SOCIOMETRICS:** The sociometric technique is a device for assessing some aspects of non-cognitive behaviour of students. It is used to assess the pattern of social relationship in group of students. The teacher who has knowledge of social relationship of his class, students can use it in arranging group work or projects. Ango (1997), however pointed out that it is important to note that in the sociometric technique, any information one get is only true for that occasion and for that, basis of choice is put to the members of the class, the pattern of the sociogram or sociometric table may change completely. Even the same basis of choice could result in a completely different pattern at another time. The pattern of social relationship in a class is never constant for all the time or for all reasons.

j. **ANECDOCTAL RECORDS:** This is another simple technique for assessing affective behaviour of the student. According to the F. M. E (1985), anecdotal records involve recording by the teacher of anecdotal

events in the life of the child, this is an informal duty and is premeditated. Whenever the child does anything striking, the teacher makes an objective report of it. This report is made without any judgment or explanation. According to NTI (2006), the reports accumulated over the years and when occasion warrant, the report can be read and an assessment of the child's character is made. Also, spontaneous, unexpected or unique observations about the whole class in a day's activities that worked welt or poorly, pupil's behaviour under certain situations, etc could be recorded for future inferences to improve teaching. This will sharpen and focus the teacher's attention to what is happening around in class, so important events are not overlooked. Thus, any person reading through students anecdotal records can make an assessment of the typical behaviour of the student.

2.7 Summative System of Assessment

Based on the nature of the summative system of assessment in Nigeria. Ipaye (1982), saw this assessment as an end of course procedure; to him examinations were bigger tests, more formal and anxiety provoking. He maintained that many students feared examinations, especially end of session examinations Ipaye, believed that some students even had a feeling that if they failed a particular examination, it might mean to them the end of their careers. He concluded that once a student has failed an end of course examination, he was out of the system. Ipaye failed to suggest a remedy or its alternative. His work is related to the present research in the sense that he has noted the importance of students achievements in examination.

Emmanuel (1993), stated that tests were less threatening and therefore less likely to push students to serious examination malpractice. Dodo (1985), stated that

in the objective test, the items included short answer questions, sentence completion, true or false items, multiple choice and matching items. He added that in objective test all candidates were expected to give the same correct answer and many items could be completed within a short time. He concluded in the objective test that such tests were easy to mark but usually difficult to set, since it should cover the entire syllabus taught to students. Dodo only mentioned the advantages and disadvantages of the objective tests on the side of the teacher but he failed to mention any on the side of the students and so he did not give solution to the problem.

Cliff and Imrie (1981), writing on the summative system of examination stated that, examinations were used to control entry into institutions or to predict success or failure and to classify students. To them, examination should arouse anxiety and stress on how to approach a particular question. They viewed summative system of assessment as examinations taken at the end of course to determine those students who could proceed to institutions and those who are to remain dropouts. Their work has succeeded in criticizing the summative system of assessment for using examinations to determine fate of students but has failed to mention the right way to follow. Their work is related to the present study in the sense that, weakness in the summative system, which has been clearly pointed out demands an alternative system where Continuous Assessment scores can be related to examination scores. While commenting on one short system of assessment, Ikejiani (1971), submits that it is responsible for the undue importance that is attached to paper qualification in the society. He writes that the cult of certificate has impeded education in our country, we have imprisoned the minds of our youths instead of releasing them to invent, discover, build and produce. Our

education has been barren, so that very soon, we shall face the problem of having "educated" people but not qualified to do the work needed for the welfare of the nation. Still on the summative system of assessment, Olaitan and Agusiobo (1978), pointed out that the system is largely responsible for the disproportionate number of school dropouts. To this end, they commend that the society, the industry and the students themselves have frowned against failure of the school to provide them with tools with which they would compete favourably in the competitive world of work. These observations among others against the single final examination used in assessing learning over a period of time leads to the introduction of Continuous Assessment. As a result of the importance attached to this method, it runs through the veins and marrows of the National Policy on Education.

2.8 Teachers Role in Administration of Continuous Assessment

The classroom teacher, Form Master, Year Group Master, Game Master, Examination Officer are the main implementers of Continuous Assessment systems in schools. This is because they are always with the students whether teaching, counseling or rebuking. They know more about personalities of students and their academic performance, they can from their interactions with students give the most reliable information about students in terms of academic and non-academic capabilities. The quality of Continuous Assessment and instructions depends upon the above categories of teachers vis-à-vis the success of the Continuous Assessment system (Abbas 2000). The teachers should possess the skills of planning and construction of achievement and aptitude tests to evaluate teaming. It is their duty to teach, assess and record the Continuous Assessment scores in all the Continuous Assessment. Yoloye (1984), emphasized that the teacher should possess "skills in record keeping and preparation of report". The teachers do the computations and

interpretations of students scores. The computation and weighing of student scores demand special skills, for teachers to provide good and reliable results therefore,the teachers' need time to accurately compute the students scores. This is why Enaohwa and Eferakaje (1989), reported that most teachers complain of the much time devoted to the computation of test scores, using different statistical tools with the aim of satisfying the requirements of Continuous Assessment. The need to guide students on Continuous Assessment cannot be overemphasized; the students' need to know the significance of Continuous Assessment on their academic achievement. The teachers must stress the importance of Continuous Assessment on the overall achievement of students in all the subjects they offer. It seems also that some teachers do not understand the rational for Continuous Assessment in schools, thus teacher made test suffer from various vices including lack of validity and reliability and non-comparability of standards (NTI, 2006). The setting and grading of students Continuous Assessment score is very important because it is the only way to determine the level of students' academic achievement. According to Abbas (2000); "The practice in most tertiary institutions is that the teacher is left to handle all matters concerning Continuous Assessment. The teacher is expected among others to take into consideration attendance at lecture (for which he is expected to keep a record), participation in lectures and tutorials, assignment and tests". Depending on institutions, specific points have been allocated to these focal areas in the final computation of Continuous Assessment scores. In the course of administering Continuous Assessment in the classroom, the teachers are able to identify some learning difficulties, which may affect the students score in the final examination. Using many variables such as punctuality, attendance at class, carrying out assignments, participation in class, the teacher assesses students affective and psychomotor domains. This is a bit difficult

especially in tertiary institutions where teachers usually have to contend with high student-teacher ratio.

According to Mathew (1997); "It is only when teachers are able to assess students properly that they can make positive decisions that affect students". The foregoing has shown that Continuous Assessment means more work for both the teachers and the student. What determines the success of Continuous Assessment is the readiness of the two to play the game according to the rule. The operation of Continuous Assessment in some higher institutions has been faced with some limitations and irregularities. There is the problem of correlating Continuous Assessment scores with actual examination scores. For instance, a student will have very high scores in Continuous Assessment and an extremely low score in the final examination.

Investigations carried out by Hassan (1987), shows that classroom teachers mostly lack the technical knowledge of how to design a valid assessment instruments. Olaitan and Oyedele (1994), pointed out that most of the students today are ready to satisfy any lecturer in cash or in kind in order to get the assessment they desire. A situation like this is a serious threat to the authenticity of assessments in our schools, finally teachers integrity is fundamental in the implementation of Continuous Assessment effective use of assessment instruments to report on each student objectively and the teacher requires utilizing the feedback to improve instructions.

2.9 Gender Related Difference in Achievement in Science

The influence of gender on learning ability, achievement and interest in science can never be overemphasized. Results of several researches conducted over the years revealed that there is relatively significant difference in students' achievement in science subjects. Shemesh (1990), reported that there is narrow participation of girls in high school courses of science and technology as well as low number of women who had professional career in science and technology. Data collected by Shemesh also revealed that while boys are more oriented towards the so called "hard" subjects and sciences (Chemistry, Physics, etc), girls prefer the "soft" subjects such as human physiology, plant life, zoology, etc. Young and Frasher (1994) reported that gender differences in science and achievement occurs as a result of a number of social factors both at home and in school.

Adegive (2000), attributes differences in the learning ability of boys and girls to socialization process because girls are denied out of school and pre-school experiences in problem solving especially those involving activity and behaviours that inhibits the development of maths and science capability in girls. Nwosu (2001), in her study revealed that exposure to science process skill based learning involving activities for both girls and boys yield more effective learning irrespective of gender and ability level. Report by Danladi (2003), also revealed no significant difference in achievement between girls and boys on tasks involving process skill acquisition. Nwosu suggested that gender stereotyping has to be discouraged in homes, schools and societies to enable girls participate freely in the learning of science.

2.10 Continuous Assessment in Other Countries

The global influences affecting education and how we assess it will soon

reach into most classes in the world. One consequence of these global influences, such as changes in the world economy, the information revolution, environmentalism and cross-national health threats, is the move away from the heavy use of traditional, more judgmental approaches to assessment towards alternative, more inclusive means of determining what learners know and can do. In the same spirit, South Africa has committed to not just reforming but transforming its educational system nation-wide. Its major policies outcome-based education and Continuous Assessment, offer relevance to teachers and learners worldwide. (National Education Ministry, 1996).

The mode of operation of Continuous Assessment differs from one country to another in terms of universality and control to the extent that within the same country the operation might not be uniform. This is due to the fact that different examination boards use different criteria of evaluation or certification, which brings about the problem of standardization. The different criteria of evaluation being used by various examination boards makes some certificates superior to others. In Great Britain, particularly in England, there are two examination boards - the General Certificate Examination (G. C. E) and the Certificate of Secondary Education (C.S.E). The G. C. E is a National body, which is solely for external examination though it incorporates some Continuous Assessment marks. The C.S.E boards are established on regional basis and focused on assessment of students who are academically weak. However, recent report by Turton (1991), indicated that G. C. E and C. S. E have been scrapped because of mounting criticism and have been replaced by a single examination system called the General Certificate of Secondary Education (G. C. S. E).

In United States of America (USA), Ipaye (1982), has stated that only New

York State has an external examination, which brings about multiplicity of standards. As a result, some institutions of higher learning and employers of labour usually resort to using standard test to select suitable candidates. However, the teachers are experts in standardized testing and so there is validity and reliability in the examination system. In Australia and Canada, it has been reported by Nwaeze (1998), that the state of Victoria in Australia has long incorporated the Continuous Assessment scores into the external examination system. There is free flow of information as regards methods of assessment and item generation. Some provinces in Canada have abolished public or external examination, which comes at the end of high school courses. Some examination boards incorporate the Continuous Assessment marks into their final examination marks standardized tests are used to select students for high school and the teachers assessment have been found to be good.

In African countries that practice the system, the few known countries like Kenya, Botswana and Zambia have common examination systems. The West African Examination Council is responsible for conducting public examinations, while the Kenyan Examination Council has its own internal examinations at Nairobi brought to it by the subject panels or specialists with low premium attached to the Continuous Assessment system. Emmanuel (1993), reported that Kenya and Zambia among others are operating the Continuous Assessment system, but did not go further than that. The operation of the system is at infancy stage and not yet developed.

From the above review of Continuous Assessment in countries other than Nigeria, it is observed that teachers must have good knowledge of tests and measurement to be able to generate good items for internal or external examination. This indispensable knowledge of item generation would forestall multiplicity of

examination boards. This is because different examination boards would now use standard and similar criteria for assessing candidates.

2.11 Review of Related Studies on Continuous Assessment and Academic Achievement

Most of the studies on Continuous Assessment are either correlation, comparative or predictive. However, some of the studies carried out on Continuous Assessment are as follows. Durotolu (1994), used Pearson Product Correlation Coefficient to determine the predictive strength of JAMB scores certificates and periodic assessment on the end of semester performance of students revealed that periodic assessment showed the highest predictive power of the variables considered. The findings suggest that periodic assessment techniques are very effective measures of academic performance certificate worth and entrance examination results were not significantly related to end of semester performance.

Jimoh and Durototu (1988), compared the entry qualification of NCE students with their performance in education courses using WASC/GCE, Grade II and pivotal as entry qualifications. The study revealed that the three categories of students showed no significant superiority or otherwise in education and teaching practice. Abdullahi (1983), examined the correlation between JAMB examination results and first university examination results. The study revealed that JAMB scores in Physics, Chemistry and Economics significantly correlated with university scores in the same subjects while JAMB scores in Biology and Geography showed no significant correlation with university scores.

Hassan and Adeyanju (1998), studied the predictive validity of performance in Continuous Assessment in Senior Secondary Schools Examination (SSCE) in 13 Secondary Schools. The study revealed that the majority of the Secondary Schools

showed no significance relationship between Continuous Assessment scores in English and Mathematics. However, there is significant relationship between gender of students and the predictive validity of interview tests scores for admission into Colleges of Education. The results revealed that interview tests scores are predictive factors for NCE achievement in Agricultural Science, Biology, English Language, Geography but Physics showed no significant relationship between interview tests scores and NCE achievements. Aliyu and Ngadda (2000), studied the relationship between formative evaluation scores and summative evaluation scores using College of Education, Gashua as a case study.

The study further reveals that there is a strong positive correlation between formative evaluation and summative evaluation of the subjects considered, the results further confirms the assertion that formative evaluation scores are good predictors of end of semester examination grades.

Emmanuel (1993), examined the roles Principals and Teachers play to influence the achievement of the Continuous Assessment objectives. The study revealed that there is shortage of career guidance in Secondary Schools in Kaduna State. The study further revealed that it is the duty of teachers to assess and keep records of Continuous Assessment to avoid mutilation or lost. Olatunji and lyede (1994) made an attempt to appraise the practice of Continuous Assessment in Nigerian Schools since its inception. Suggestions were made on the various ways through which the scheme can be made to assume a better focus in the minds of schools functionaries, parents and employers of labour.

Iheigbulem (1994), determined the degree and significance of relationship (consistency) between Continuous Assessment and examination, cognitive scores of the group of students admitted into NCE (technical) programme. It also determined

whether both groups differ significantly in degree of relationship between their own sets of scores. It was found out that a substantial and significant degree of relationship existed between Continuous Assessment and examination scores of each group. It was also found out that both groups did not differ significantly in degree of relationship between their two sets of scores.

Mathew (1994), pointed out that students progress is evaluated through both Continuous Assessment and semester examination in Colleges of Education, both assessment methods are supposed to be related for them to be used together. The relatedness was for the focus of his study in manual arts. The result shows that some Continuous Assessment scores are related to examination scores. It is the view that the benefit derived from the evaluation practice is many hence, it should be practiced properly.

Danjuma (2004), in his study examined the extent of reliability of Continuous Assessment as a predictor of students performance in end of semester examinations. The results revealed a significant relationship when the student scores from Continuous Assessment were correlated with their examination marks. Similarly, when Continuous Assessment scores of those with average of high scores were correlated with the examination scores, there was a significant relationship.

2.12 Implications of the Literature Review to the Present Study

The literature reviewed so far indicated that Continuous Assessment is practical in almost all the schools in Nigeria. This implies that the present study is in line with the practice in all schools. The studies from the literature show that the teacher is the main implementer of Continuous Assessment, which is also in line with this study. Almost all the literature gone through by the researcher is correlative,

predictive or comparative while this research is experimental, which makes it unique and of considerable importance. Some of the researches carried out show positive correlation between examination scores but others show negative correlation. So this research also intends to find out whether more Continuous Assessments will affect final examination scores of N.C.E chemistry students. The effect of gender is also to be investigated and finally the research, will investigate the relationship between Continuous Assessment and final examination scores of N.C.E. chemistry students

CHAPTER THREE

METHOD OF STUDY

3.1 INTRODUCTION

This study investigates the effect of Continuous Assessment on academic achievement of NCE chemistry students in colleges of education in Kaduna state.

In this chapter the research design, population, sampling procedure, research instrument and procedure for data analysis would be discussed. This chapter is organized around the following subheadings:

- Research Design
- Population of the Study
- Sample and Sampling Procedure
- Research Instrument
- Pilot Study
- Item Analysis and Item Difficulty Index
- Validation of the Instrument
- Reliability of the Instrument
- Data Collection Procedure and Administration of the Instrument
- Data Analysis Technique.

3.2 Research Design

In this study, the pre-test post-test quasi experimental control group was employed. Three groups were used for this study, i.e. the experimental groups which consist of two groups (students exposed to two sets of C.A's) E_2 and (students exposed to four sets of C.A's) E_2 and the control group (C) (students exposed to no C.A) which consists of one group. This kind of design has been recommended by Rose and Smith (1971) and used by Amedu (1998). The experimental groups were exposed to the treatment i.e. the first group was given two sets of C.A in a

semester while the second group was given four sets of C.A in a semester due to the fact that in most institutions C.A is given mostly once or twice. For the second group which was given four C.A, it is meant to test and see if more C.A means better achievement in the final examination since C.A is now a norm across institutions, which is often combined with examination to reach a final score determining a pass or fail for students.

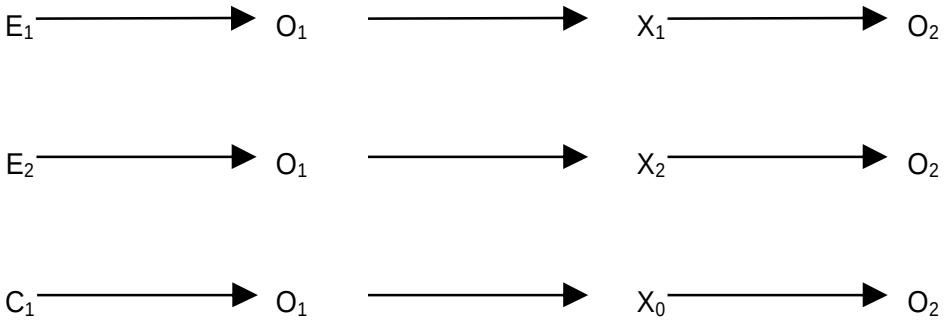
According to Imrie(1981), the educators clearly have two professional responsibilities, namely:

(a) To teach a course (develop students understanding).

(b) To examine students at the end of the course (assess students performance).

The course to be used in this study is an organic chemistry course. Due to the fact that the researcher teaches the course, all extrinsic variable will be minimized. The students from experimental and control groups were divided into four equal groups and a pre-test of (OCT) organic chemistry test was administered to the four groups before the commencement of the treatment to determine the equivalence of the four groups. The scores obtained from pre-test was analyzed using (ANOVA) statistic to actually find out if the four groups are equivalent. And it was found that there is no significant difference in the scores of the four groups after the pre-test. Details are found in the appendix three groups were chosen out of the four equivalent groups.

A post-test was administered at the end of the treatment which comprises the same organic chemistry test (OCT). The design of the study is represented thus:



Adopted from Kerlinger(1973).

Were

E_1 - 1st experimental group.

E_2 - 2nd experimental group.

C_1 - control group.

X_1 - instruction with 2 Continuous Assessment.

X_2 - instruction with 4 Continuous Assessment.

X_0 - instruction without Continuous Assessment.

O_1 - pre-test.

O_2 - post -test.

The advantages of this design is that;

- It can be used to give indication of gain in understanding of selected test due to the application of the treatment.
- It helps to show whether the treatment given has an effect on the groups.
- The mean scores and average of the three groups can be calculated.

3.3 Population of the Study

The population of the study comprises all the NCE chemistry students at Colleges of Education in Kaduna state, which comprises Federal College of Education Zaria and College of Education, Kafanchan. In conducting a research it is desirable to study the entire population when,

1) The population of the study is small
2) The researcher has a lot of time at his disposal
3) The researcher has adequate human and material resources for the study
4) The demand of the study is to make a complete count or record of the entire population.

Similarly the researcher may decide to study only a portion of the population when:

1) The population of the study is large
2) Time available for the study is limited
3) The researcher has inadequate human and material resources for the study (Akuezeilo,1993).

The schools and the number of students are provided in the table below.

Table 3.1 Population for the study

S.No	Name of Institution	Location	No. of students enrolment		Total
1	Federal College of Education, Zaria	Zaria	Male	Female	
			138	92	230
2.	College of Education Kafanchan	Kafanchan	84	36	120
	Total		222	128	350

(Academic Office students admission list, 2006 of F.C.E, Zaria and College of Education Kafanchan).
From the above population of 350 students, sample used was selected as the study subjects

3.4 Sample and Sampling Procedure

A purposeful sampling technique was used for the purpose of the study. Since there are only two Colleges of Education in Kaduna state, namely: F.C.E, Zaria and College of Education Kafanchan. College of Education Kafanchan serves as the control group because there is a research assistant there while F.C.E Zaria serves as the experimental group because the researcher lectures at the institution. Stratified random sampling was used to select the students that will participate in the study. 120 students were chosen from the two college of education which represents 34% of the total population. This sample size is in accordance with that suggested by (Roscoe,1971) that at least 10% of the total population can be taken as sample size which is also in accordance with the sample ratio recommended by Morgan and Krejae, (1975).

NCE I students were used in the study because the researcher teaches at that level. The students score sheets were used to identify those who have fully registered and sat for the first semester examination.

Table 3.2 Sample from Study Population:

S. no	Name of Institution	Location	Gender		Total
			Male	Female	
1.	College of Education	Kafanchan	30	30	60
2.	Federal College of Education	Zaria	30	30	60
Total			60	60	120

3.5 Instrumentation

An organic chemistry Test (OCT) consisting of 40 multiple choice items was administered to the samples as pre-test. The 1st seventeen items were adopted from Derek (1980), a multiple choice questions for A - level chemistry. The remaining items were constructed by the researcher and validated by 5 specialists in the subject matter. The summary of the items in the instrument and the area each item tends to cover is shown in the following table of specification

Table 3.3 Table of Specification

Item	**Specific Area Covered**
1,2,14,18,20,25,27,37,38	Hydrocarbon
4,5,6,19,30	Hybridization
7,8,31	Nomenclature
10,11	Isomerism
12,16,17,22,30	Properties
21,23,32,33,34,36,38,40	Reactivity
13,16	Aromatic Hydrocarbon
29	Functional Group
15	Test

The area covered are the course content from the syllabus

3.6 Pilot Study

The instrument outlined above is pilot-tested, before the final administration to the samples: A sample of 40 students in their first year at college of Education Gumel were used for the pilot study. The purpose of the pilot study as in Bichi (2002), is to:

a) determine the reliability strength of the instruments before administration.
b) assess the feasibility of the study before trial
c) identify possible problems or difficulties that respondents may encounter with a view to eliminating them.
d) diagnose possible mistakes students may commit in responding to test items with a view to eliminating them in the final treatment.
e) determine the approximate time duration which the subject would need to answer the test items properly. The appropriateness of the instrument in terms of clarity of the items and the facility of the test items will also be determined.

3.7.0 Item characteristics of the instrument

3.7.1 Item facility index

This is the percentage of the students who obtain the correct answer on an item. To compute the difficulty index for each item on the test, the steps are as follows:

- Ranking-order of the scores on the test from highest to lowest
- Identification of the high-scoring group and the low scoring group. The top-scoring one third of the students and the bottom scoring one third
- Determination of the percentage of high scorers and low scorers passing an item
- Computation of the item difficulty index by adding the percentage of

those correct in the low scoring and high scoring and then divide by

The formula is $P = \frac{U + L}{N}$ (N.T.I., 2006)

P = item difficulty

N = number of students involved in the analysis

U = no of students that got the item right in the upper %.

L = no of students that got the item right in lower [1]A Difficulty index of 75% or higher is regarded as easy in terms of difficulty level; where the index is 25% or less, the item is hard in terms of difficulty level.

In the (OCT) organic chemistry, test items with difficulty index which ranges from 25% to 75% were retained, while the discrimination index with ranges from 0.40 to 0.70 were used for the study.

3.7.2. Validation of the Instrument

The items were submitted to the following experts for content as well as face validation:

- A lecturer in chemistry department, A.B.U Zaria.
- A lecturer in science education department, A.B.U, Zaria.
- Two lecturers in chemistry department, F.C.E, Zaria.
- A lecturer in English department, A.B.U, Zaria to assess the language component of the instrument.
- A lecturer in Mathematics education department, A.B.U, Zaria to assess the statistical component of the instrument.

The experts have been requested to critically examine and assess all the items of the instrument baying attention to the following: whether

(a) the test items test for what they are meant to test;

(b) the questions are clear, precise and free from ambiguity;

(c) the questions match the ability of the students;

(d) the questions adequately cover the syllabus; and

(e)the language expression is simple and unambiguous. The experts made constructive criticism and corrections.

3.7.3 Reliability of the Instrument

The degree of error or precision in measuring an estimate of a test is called its reliability (Odama,1982) in (Bichi, 2002). A test is said to be reliable if repeated measurements using the test gives more or less the same results.

Reliability of (OCT) organic chemistry test was determined by subjecting the scores obtained after the pilot study to statistical operations to calculate the reliability coefficient.

$$r = \frac{(I - \sum pq}{\delta^2 x}$$

Where

r = reliability coefficient,

n = number of items in a test.

p = proportion of students who answer an item correctly,

q = proportion of students who got an item wrong or fail an item.

$\delta^2 x$ = variance in test scores.

Using the data obtained from the pilot study, the reliability of the instrument was found to be 0.7 meaning that it is reliable.

3.8 Data Collection and Administration of the Treatment

The instrument used for the different sets of C.A's is the teacher made test (TMT). The instrument comprises of four different sets of 10 questions making a total

of forty questions. The first experimental group (E_1) was exposed to two sets of C.A's while the second experiment group (E_2) was exposed to four(4) sets of C.A's. details of the questions, scores and marking scheme are found in appendix D - M.

3.9 Administration of the Treatment

To remove any possible effect and bias, the experimental and control groups were taught with the same techniques/method and the same steps were followed. The control group was taught but without any C.A's through out the contact session, the experimental group are two groups one of the groups E_1 was given C.A after five weeks making a total of 2 C.A per semester while the other experimental group E_2 was given (4) four C.A at 3 weeks interval. The results obtained from the various C.A's and the final examinations form the data for the research. The scores of the groups E_1,E_2,C were collated and collected hence subjected to data analysis

3.10 Data Analysis Technique.

The analysis essentially involved statistical testing of the hypotheses stated in chapter one. The level of significance adopted is $P < 0.05$. This level of significance forms the basis for retaining or rejecting each null hypothesis.

Analysis of variance (ANOVA), the F - test were used to test the first hypothesis. While T-test statistics was used to test the second and third hypotheses and finally the Pearson product moments correlation coefficient (r) was used to test the 4^{th} and 5^{th} hypotheses. Each of the hypotheses was restated as found necessary

CHAPTER FOUR

ANALYSIS OF DATA AND DISCUSSION OF RESULTS

4.1 Introduction

In this chapter, data obtained from the instrument (OCT) administered during the post-test was analysed and presented. The analysis essentially involved statistics testing of the hypotheses stated in chapter one. The level of significant adopted is $P \leq 0.05$ which forms the basis for retaining or rejecting each of the null hypotheses stated.

The statistics used for the first hypothesis was the one - way Analysis of Variance Anova F - test, then t - test statistics was used to test the second and third hypotheses while Pearson Product Moments Correlation Coefficient (r) was used to test the fourth and fifth hypotheses. Each of the null hypotheses is restated below.

4.2 Presentation of Results

These are summaries of the analyses and the hypotheses are restated for the purpose of the analysis.

HO_1: There is no significant difference in the mean academic achievement scores of students exposed to Continuous Assessment and those assessed using final examination only in chemistry. One way analysis of variance (Anova) was used to test the significance of the difference the mean scores of students exposed to two C.A, four C.A and no C.A.

Table 4.1 Analysis of Variance of mean academic achievement scores of students exposed to two C.A four C.A and no C.A

Source of Variable	df	SS	MS	F	P	Remarks
Between group	2	1918.289	959.144	25.777	0.000	Significant
Within group	87	3237.267	37.210			
Total	89	5155.556				

Significant at P ≤ 0.05

The F - value of 25.777 obtained as shown in table 4.1 is higher than the critical F - value of 3.07 at P ≤ 0.05 level of significant. The null hypothesis is therefore rejected. This means that students exposed to more C.A perform significantly better than those exposed to fewer C.A. This shows that Continuous Assessment influences positively the performance of students in chemistry also the P 0.00 is lower than 0.05.

Ho_2 - There is no significant difference between the mean academic achievement scores of male and female students exposed to two sets of Continuous Assessments in chemistry.

Table 4.2 Comparison of mean scores of males and females exposed to two sets of C.A.

Variable	N	X	SD	SE	Df	t	P	Remarks
Male	15	23.600	5.207	1.3445	28	0.335	0.07	Not Significant
Female	15	24.2667	5.6879	1.4686				

Not significant at P≤ 0.05

The results from table 4.2 indicate that there was no significant difference in the academic achievement in chemistry of male and female students exposed to two

set of, C.A. The P value of 0.07 is higher than 0.05 which is the level of significance that was set for the experiment this shows that male and female do not differ significantly when exposed to few Continuous Assessment. The t - statistics at df = 28, and 0.05 level of significance is 2.048. The calculated value 0.335 is less than the critical value.

Ho_3 - There is no significant difference between the mean academic achievement scores of male and female students exposed to four sets of Continuous Assessments in chemistry.

The null hypothesis was used to determine whether the mean academic achievement of male and female students exposed to four set of Continuous Assessment will differ significantly.

The scores of male and female students exposed to four set of Continuous Assessment was analyzed using t - test statistic to test this hypothesis and the result is shown in table 4.3.

Table 4.3 Comparison of the mean scores of male and female students exposed to four set of Continuous Assessment

Sex	N	X	SD	SE	t	P	Remarks
Male	15	31.87	5.29	1.37	2.166	0.039	Significant
Female	15	26.47	8.08	2.09			

Significant at $P \leq 0.05$

The result from table 4.3 indicate that male and female students differ significantly in achievement in chemistry when they are exposed to four Continuous Assessment this shows that males perform significantly better than females when exposed to many Continuous Assessment in a semester. This is because the t -statistics at df =

28 and 0.05 level of significance is 2.048, t - calculated is 2.166. The null hypothesis is therefore Rejected.

$H_{:4}$ – There is no significant relationship between the mean Continuous Assessment score of NCE Students exposed to two sets of Continuous Assessment in chemistry.

Table 4.4 – Relationship between the mean C.A. and final examination scores of NCE chemistry students exposed to two sets of Continuous Assessment in chemistry.

Variable	X	SD	r	df	P	Remarks
C.A	19.4000	5.1233	0.081	28	0.670	Not Significant
Exams	23.933	5.3687				

The results from table 4.4 shows that Pearson correlation coefficient (r) of 0.081 at 0.05 level of significance is less than the critical value of 0.323 which is an indication that there is no significant correlation between C.A and examination scores. The Null hypothesis is therefore retained.

Ho_4 - There is no significant relationship between Continuous Assessment scores and final examination scores of N.C.E. chemistry students exposed to four sets of Continuous Assessment.

TABLE 4.5 - Relationship between C.A scores and final examination scores of NCE chemistry students exposed to four set of C.A

Variable	X	SD	Df	r	P	Remarks
C.A	21.1667	3.8871	28	-0.097	0.610	Not Significant
Exams	29.6667	7.4433				

Not Significant at P ≤ 0.05

The result from table 4.5 indicate that there is no significant correlation between C.A scores and final examination scores of NCE chemistry students exposed to four set of C.A, this is because Pearson correlation coefficient r of

0.097 at 0.05 level of significance is less than the critical value of 0.323. This shows that the mean C.A scores of students expose to four set of C.A did not correlate significantly with their final examination scores.

4.3 Summary of Analysis and Results

The Findings from the analysis revealed the following:

(i) The experimental group expose to four sets of Continuous Assessment performed significantly better than those exposed to two sets of Continuous Assessment and those exposed to two sets of Continuous Assessment performed significantly better than those exposed to no C.A.

(ii) Males and females exposed to two sets of Continuous Assessment do not differ significantly in their performance.

(iii) Males exposed to four sets of Continuous Assessment performed significantly better than females exposed to four sets of Continuous Assessment.

(iv) There is no significant relationship between Continuous Assessment scores and final examination scores of N.C.E chemistry students exposed to two sets of Continuous Assessment and those exposed to four sets of Continuous Assessment.

4.4 Discussion of the Results

This research work is aimed at determining the effect of Continuous Assessment on academic achievement of N.C.E chemistry students in colleges of education in Kaduna state. Five hypotheses were stated and tested on the scores obtained from the instrument, Organic Chemistry Test OCT. Data obtained from tables 4.1 to 4.5 were analysed in accordance with the stated hypothesis. The findings from the analysis is summarized as follows: The results presented in table 4.1 revealed a significant difference in academic achievement of students exposed to two set of C.A, four set of C.A and no C.A. The data obtained also shows that students exposed to more C.A perform significantly better than those exposed to two and no C.A.

The study further reveals that the students exposed to no C.A has a mean of 18.000 while those exposed to two sets of C.A's has a mean of 24.0333 and finally the students exposed to four set of C.A has a mean of 29.300. The group of students exposed to four set C.A has the highest mean followed by those exposed to two set of C.A and finally the group of students exposed to no C.A has the least mean. So the results from one way analysis of variance has shown that the more the number of C.A, the better the achievement. This might be due to the fact that exposures to C.A motivate the students to read harder as they have to spend time to prepare for each of the C.A's. As more C.A's force students to spend more time to read, those exposed to more C.A's are expected to perform better. This results is in line with the findings of Ango(1994) and Nweaze(1998), who reported that students tend to perform better

when exposed to more drills.

The results from table 4.2 revealed no significant difference in the academic achievement of male and female students exposed to two sets of C.A's. This result supports the earlier findings by Danladi(2003) and contradicts the findings of Musa(2000). This might be due to the fact that male and female students do not differ significantly in performance when they are exposed to tasks that are moderately stressful. It seems that emotional stress from two C.A's are moderate and has little or no effect on the performance of female students. This is in line with the findings of Arbogast(1997), who suggested that female students due to their feminine nature can withstand only moderate stress. This report also contradicts the findings of Mari (1994), on gender and that of Shuaibu and Mari(1997), where a significant difference was observed between academic achievement of male and female.

The results presented in table 4.3 shows a significant difference in the academic achievement of male and female students exposed to four sets of C.A's which contradicts the result of the students exposed to two set of C.A's. The difference may be due to the high stress involved in preparing for so many C.A's, the more the number of C.A's the higher the stress the students are subjected to. As males are able to cope with stressful experiences more than females due to their superior physical and emotional stability over females. They are expected to perform better at high stressful conditions than females.

From the value of the mean scores, the male students have a mean score of 31.80 while the female students have a mean score of 26.47. Therefore, the male students with the highest mean perform better than the female students. This could be because the male students can withstand more stress and the rigorous drills involved in preparing for four sets of C.A's due to their masculine nature than the

female students due to their feminine nature. The difference as revealed by results in the academic achievement of male and female students may be attributed to cultural and social factors. Women are socialized in preparation of their roles as wives and mothers while men are socialized and oriented to take up masculine roles of high prestige and high skills as in (Bichi, 2002). Some of the female students are married with children, so they have other responsibilities at home unlike the male students that are mostly bachelors. The results presented in table 4.4 shows that there is no significant correlation between C.A. and final examination scores of NCE chemistry students exposed to two set of C.A. This might be due to the fact that smaller portion of the syllabus is being considered in the administration of the C.A and this will make the preparation for the C.A to be less stressful which makes the performance in C.A to be better than the examinations which has wider coverage of the syllabus. Also the strictness in terms of invigilation and examination rules and regulation are more during examinations when compared to during C.A. Therefore, students tend to be involved in examination malpractice during the administration of Continuous Assessment as compare to final examination. This result is in line with the findings of Durotolu, (1994), where by he conducted a research correlating C.A and examination scores and find out there is no positive correlation between examination scores and final examination scores.

In table 4.5 the results obtained shows that there is no significant correlation between C.A scores and final examination scores of NCE chemistry students exposed to four sets of Continuous Assessment. The results obtained in table 4.5 might be due to the same reasons as those of table 4.4. This result contradicts the findings of Aliyu and Ngadda (2000), whose study reveals that there is a strong positive correlation between formative evaluation and summative evaluation of the subjects considered.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The study deals with determining the effect of Continuous Assessment on academic achievement of N.C.E chemistry students. The data obtained was analyzed using F-test, t- test and Pearson Product Moment Correlation Coefficient statistics. In this chapter a summary of the results obtained is provided. The chapter also deals with the following specific areas.

- Summary
- Conclusions
- Recommendations
- Limitations
- Suggestions for further study.

5.2 Summary

This study investigated the effect of Continuous Assessment on academic achievement of NCE chemistry students in Kaduna state. Two Colleges of Education were used for the study, namely: F.C.E, Zaria and College of Education Kafanchan. NCE I chemistry students were used for the study. One of the colleges was assigned to be the experimental group while the other college formed the control group. The experimental group is further divided into two groups E_1 and E_2 was given two sets of C.A's per semester while E_2 was given 4 sets of C.A's per semester and the control group is left without C.A. The concepts selected are in organic chemistry. Five hypotheses were formulated and tested using F- and, t - test

and Pearson Product Moment Correlation Coefficient

A pre-test, post -test quasi experimental control group design was used for the purpose of data collection. A pretest was first administered using (OCT) organic chemistry test before the treatment was given and the results from the pretest was subjected to F - test to determine the equivalence of the groups. Subsequently, there was an intensive (12) twelve weeks teaching session after which a post-test was given using the same instrument organic chemistry test (OCT). Teacher Made Test (TMT) was used for the series of C.A's. Data obtained from the post-test scores of the students in the three groups were analyzed at 0.05 level of significance.

Results of the data analyzed revealed that:

(a) Continuous Assessment has significant effect on academic achievement of NCE chemistry students. That is the more the C.A the better the achievement.

(b) There is no significant difference in the achievement of males and females when exposed fewer C.A's.

(c) There is a significant difference in achievement of males and females when exposed to more C.A's.

(d) There is no significant correlation between C.A scores and final examination scores of NCE chemistry students. **5.2**

Conclusions

(1) Students tend to achieve chemistry concepts better when exposed to series of C.A's.

(2) Males do not differ significantly in achievement in chemistry from females when exposed to few C.A's.

(3) Males perform better than females in final examination when they are

exposed to many C.A's.

(4) There is no significant correlation between C.A scores and final examination scores of N.C.E. chemistry students.

Recommendations

The results of this study has shown that:

(1) Students performed better in chemistry when they are exposed to series of C.A's (i.e. 4) before the final examination. Chemistry teachers should therefore strive to see that students are exposed to many C.A's before the final examination. This will go in a long way to increase their performance.

(2) The results of this study shows that few C.A is gender friendly. With many C.A's, male students performed better than female students. Therefore the teacher's should encourage both sex (male and female) to participate equally in the learning and assessment process in chemistry.

(3) The result shows that C.A scores did not correlate with the final examination. Therefore, teachers should strive to make the C.A of standard and it should be conducted under examination rules and regulations. There should also be more strictness during invigilation of the C.A.

(4) The colleges should organize seminars on Continuous Assessment for both lecturers and students. This is to acquaint all the parties involved of their roles in its practice and the things expected from them.

(5) Teachers - students ratio should be reduced to a manageable size of say one lecturer to 40 students by either employing more lecturers or reducing admission into Colleges of Education. This will help reduce the work load on lecturers and encourage them to give as

many number of C.A's as possible.

5.4 Limitations of the Study

The followings are the limitations of the study.

(1) The colleges used for the study are purposive and restricted to Kaduna state only. It comprises of one Federal College of Education and one state College of Education located in the northern part of Nigeria. This might affect the scope of generalization made on the findings as it affects the population.

(2) The use of NCE I students for the research, since they are new in the school they have not fully settled NCE II students may be better.

(3) Only one course is used for the study, Results from other courses may form basis for better generalization.

(4) The inability of the researcher to provide training for the staff that taught the control group.

5.5 Suggestions for Further Study

Based on the findings and conclusions of the study, the following suggestions are made for further study.

(1) The sample of the study were drawn from two colleges of education in Kaduna state. There is need to replicate the study in other geographical location in the country to determine if the effect will be the same or not.

(2) The subjects of the study were NCE I students, there is need to replicate the same study using either NCE II or NCE III for better generalization.

The course used for the study was chemistry, other science courses such as biology, physics or geography should be used to determine if the effect will be the same or not.

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APPENDIX A

Science Education Section,
Faculty of Education,
A.B.U.,
Zaria.

May, 2006.

Dear: _____

_____

_____

VALIDATING A RESEARCH INSTRUMENT

I have developed a research instrument designed to generate data for my master's thesis on effect of continous assessment on academic achievement of NCE chemistry students.

The course is introduction to organic chemistry an NCE course. I will therefore like you to examine the items with respect to the following if.

(a). They are testing what they are meant to measure.

(b). The questions do not need to be modified.

Mrs. Binta Muhammad,
Science Education Section,
Education Department,
A.B.U., Zaria

APPENDIX B

Science Education Section,
Faculty of Education,
A.B.U.,
Zaria.

May, 2006.

Dear: _____

_____

_____

VALIDATING A RESEARCH INSTRUMENT

I have developed a research instrument called Organic Chemistry Test (OCT) design to generate data for my masters thesis on effect of continous assessment on academic achievement of N.C.E chemistry students. The (OCT) is to measure achievement in CHE 112, introduction to organic chemistry an N.C.E I course.

You have been selected as one of panel members to validate the instrument. I write therefore to request to please critically examine the items with respect to the following:

(a) The questions match the ability of the students.

(b) They adequately cover the syllabus.

(c) The questions are clear, precise and free from ambiguity

I would be most gratefull if my request is granted.

Thanks

Mrs. Binta Muhammad,
Science Education Section,
Education Department,
A.B.U., Zaria

APPENDIX C

Science Education Section,
Faculty of Education,
A.B.U.,
Zaria.

May, 2006.

Dear: _____

_____

_____

VALIDATING A RESEARCH INSTRUMENT

I have developed a research instrument called Organic Chemistry Test (OCT) design to generate data for my masters thesis on effect of continous assessment on academic achievement of N.C.E chemistry students. The (OCT) is to measure achievement in CHE 112, introduction to organic chemistry an N.C.E I course.

You have been selected as one of panel members to validate the instrument. I write therefore to request to please critically examine the items with respect to the following:

(a) The language used is clear precise and unambiguous.

(b) The questions are clear and precise.

I would be most gratefull if my request is granted.

Thanks

Mrs. Binta Muhammad,
Science Education Section,
Education Department,
A.B.U., Zaria

APPENDIX D

ORGANIC CHEMISTRY TEST (OCT) CHE 112
OBJECTIVE TEST QUESTIONS

(1) Carbon exists in two allotropic forms namely.
- (a) Coal and coke
- (b) Graphite and diamond
- (c) Water and gas
- (d) Coalter and Coal gas

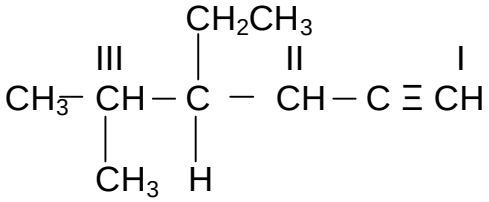
(2) The following are natural sources of organic compounds except
- (a) Plant
- (b) Fungi and microorganism
- (c) Minerals
- (d) Synthetic reactions

(3) Which of the following conducts electricity
- (a) Sulphur
- (b) Graphite
- (c) Diamond
- (d) Red Phosphorus

(4) Compounds having double bond in their molecules are usually.
- (a) SP hybridized
- (b) SP^2 hybridized
- (c) SP^3hybridized
- (d) SP^3 d hybridized

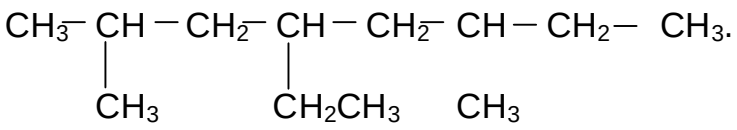
(5) The shape of methane molecule is.
- (a) Pyramidal
- (b) Linear
- (c) Tetrahedral
- (d) Triagonal

(6) The state of hybridization in carbon labelled I II III in the molecule below are respectively.



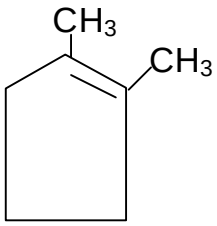
- (a) SP^2, SP^3, SP
- (b) SP, SP^2, SP^3
- (c) SP, SP^3, SP^2
- (d) SP, SP, SP^3

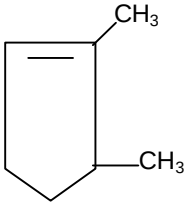
Q7) Give the IUPAC name of this compound

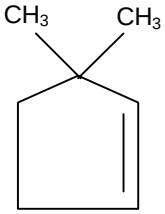


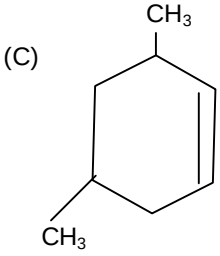
(a) 4 –ethyl-2,6-dimethyl octane
(b) 4,6-diethyl-2-methyl heptane
(c) 2,4-diethyl-6-methyl heptane
(d) 3,7-dimethyl-5-ethyl octane.

(8) Give the structure of 1,2- dimethyl cyclopentene

(a) 

(b) 

(d) 

(C) 

(9) The formula of a compound which gives the simplest ratio of the number of atoms present in a molecule of the compound is called.
(a) Structural formula
(b) Emperical formula
(c) Molecular formula
(d) General formula.

(10) Which of the following exhibits geometric Isomerism?
(a) Propyne
(b) Pentanol
(c) 2-methyl propene
(d) 1,2-dibromo ethene.

(11) Isomers which posses the same structural formula but different spatial arrangement of the groups around a multiple bond are known as:
(a) Goemetric Isomers
(b) Metamers
(c) Positional Isomers
(d) Chain Isomers

(12) The following properties of covalent bonds can be explained in terms of inductive effect except.

(a) Bond lengths
(b) Diploe moment
(c) Electromeric effect
(d) Basic strength

(13) A large number of cyclic organic compounds having alternate, double and single bonds, show unusual stability towards addition reaction but preferentially undergo substitution reaction; Such compounds are refered to as:

(a) Monocyclic
(b) Carbocyclic
(c) Aromatic
(d) Heterocyclic

(14) The name of a homologous series depends on the :

(a) First member of the series
(b) Second member of the series
(c) Member of alkyl group in the series
(d) Functional group of the series.

(15) Decolourization of bromine water is a test used to distinguish between.

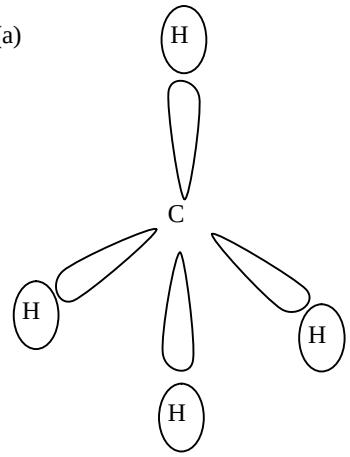
(a) ethene and ethane
(b) ethene and ethyne
(c) ethyne and ethane
(d) ethane and ethyl

(16) The following are the characteristics of Aromatic compound's except:

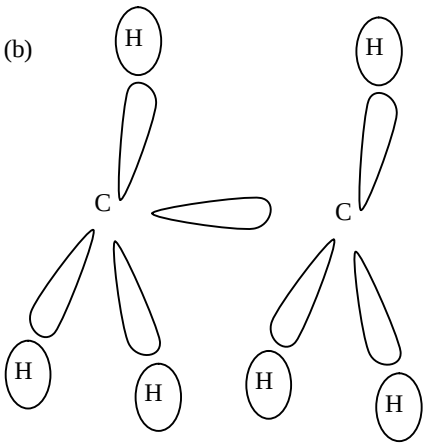
(a) It must be planer and cyclic
(b) It must be stable with preference to substitution over addition.
(c) Must contain delocalised electrons and resonance stablised.
(d) Must not obey huckel's rule.

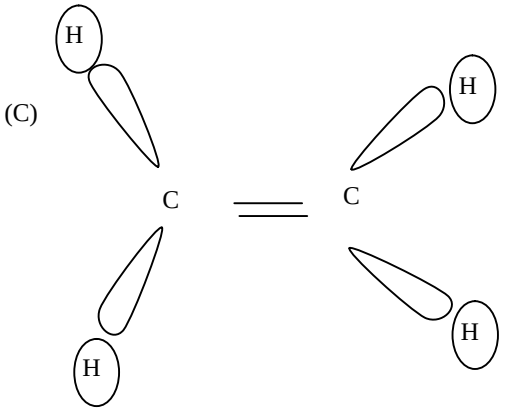
(17) The molecular orbital diagram of ethane is

(a)



(b)





(18) The alkanes are known as paraffins because
- (a) They are hydrocarbons
- (b) They consist of only single bond's
- (c) They are saturated and liner in nature
- (d) They are very reactive.

19) The hybridization state of alkenes is SP^2 and the bond angle is
- (a) 90^O
- (b) 120^O
- (c) 180^O
- (d) 360^O

(20) The process of decomposition of less volatile higher hydrocarbon into more volatile lower hydrocarbon with the application of heat and catalyst is known as
- (a) Hybridization
- (b) Conjugation
- (c) Cracking
- (d) Purification

(21) The process where by large chain macromolecules are formed from relatively small molecules (monomers) is referred to as
- (a) Addition
- (b) Condensation
- (c) Rearrangement
- (d) Polymerization

(22) Compounds that follow a regular structural pattern in which each

member differs from the next by a constant amount and their chemical characteristics are usually the same is known as:

(a) Functional group
(b) Emperical formula
(c) Homologous series
(d) Molecular formula

(23) Saponification is referred to as:
(a) Alkaline hydrolysis of base
(b) Hydrolysis of ester and water
(c) Hydrolysis of acid and alkanol
(d) Alkaline hydrolysis of fats & oils.

(24) Glucose is an example of
(a) Monosaccharide
(b) Diasaccharide
(c) Polysaccharide
(d) Oligosaccharide

(25) Which of the following is a natural source of hydrocarbon
(a) Paint
(b) Organic Compound
(c) Wood
(d) Coal

(26) Organic chemistry is better defined as chemistry of:
(a) Carbon compounds
(b) Carbon and hydrogen
(c) Hydrocarbons
(d) Hydrocarbons and their derivatives.

(27) All known organic compounds may be classified into two main carbon skeletal structures namely:

(a) Carbocyclic and homocyclic compound's

(b) Aliphatic and aromatic compounds

(c) Alicyclic and cyclic compounds

(d) Alicyclic and Aliphatic compounds

(28) Which of the following differences between organic and inorganic compound is not true?

(a) Organic compound's are volatile and combustible while inorganic compounds are not

(b) Organic compound's have characteristic class properties while inorganic compounds have none.

(c) Organic compound's are soluble in water while Inorganic compound's are not

(d) Organic reactions are generally non-ionic, reversible and non-spontaneous while irreversible and spontaneous.

(29) Which of the following has alkanol functional group.

(a) $CH_3CH_2OCH_3$

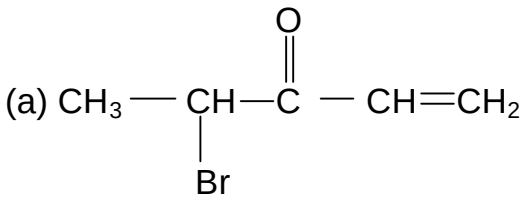
(b) $CH_3CH_2CH_2OH$

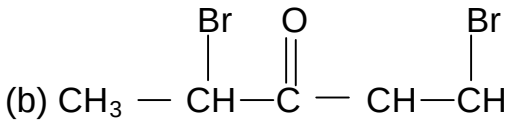
(c) CH_3COOCH_3

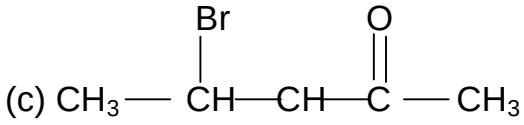
(d) CH_3COCl

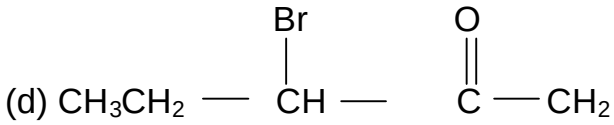
(30) The distance between two atomic nuclear in covalently bonded atoms is known as:
(a) Bond angle
(b) Bond length
(c) Bond distance
(d) Bond energy.

(31) Write the structural formulae of 4 – Bromopenten –3-one.

(a) 

(b) 

(c) 

(d) 

(32) The following are electronic factors of structures on reactivity except.
(a) Inductive effect
(b) Hydrogen Bonding

(c) Electronmeric effect
(d) Covalent bonding.

(33) Esterification of propan 1,2,3 triol and unsaturated higher carboxylic acids will produce:
(a) Fats
(b) Methyl propanone
(c) Methyl propanoate
(d) Alcohols

(34) An organic compound which readily reacts with bromine to form a compounds with the formula $CH_3CHBrCH_2Br$ is
(a) ethene
(b) Propane
(c) Butane
(d) Propene.

(35) Which of the following exhibits resonance?
(a) Benzene
(b) Butane
(c) Pentane
(d) Octane

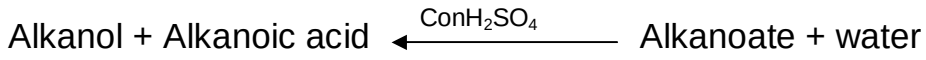
(36) Ethene undergoes mainly addition reactions because it is:
(a) A gas
(b) A hydrocarbon
(c) Unsaturated
(d) Covalent

(37) Which of the following is an unsaturated compound.
(a) 2-methyl butane
(b) Chloromethene
(c) Methyl benzene
(d) 1,2-dibromoethane

(38) Alkanes are used mainly.
(a) In the production of plastics
(b) As domestic and industrial fuel.
(c) In the textile industry.
(d) In the hydrogenation of oils.

(39) An alkene may be converted to an alkane by:
(a) Halogenation
(b) Hycholysis
(c) Dehydration
(d) Hydrogenation

(40) The type of process involved in the reverse reaction represented by this equation is:



(a) Esterification

(b) Hydrolysis

(c) Saponification

(d) Organic reaction

APPENDIX E

Marking scheme for (OCT)
Model answer

(1) B
(2) D
(3) B
(4) B
(5) C
(6) B
(7) A
(8) A
(9) B
(10) D
(11) A
(12) C
(13) C
(14) D
(15) A
(16) D
(17) B
(18) C
(19) B
(20) C
(21) D
(22) C
(23) D
(24) A
(25) D
(26) D
(27) D
(28) D
(29) B
(30) C
(31) A
(32) D
(33) C
(34) D
(35) A
(36) C
(37) C
(38) B
(39) D
(40) B

Total marks = 40 marks

APPENDIX F

TEACHER MADE TEST FOR FIRST C.A

INSTRUCTIONS

The test consist of 10 items selected from General Organic Chemistry concept each item in the test is followed by 4 alternative responses lettered (A – D) circle the letter of the option/responses you choose for each item.

1. Alkanes have the general formula given by:
   (a) Cn H_2 n + 1
   (b) Cn H_2n + 2
   (c) Cn H_2n – 1
   (d) Cn H_2n – 2
2. Compound having the same molecular formula but different structure formula are referred to as…….
   (a) Isomers
   (b) Isotopes
   (c) Insulators
   (d) Ions
3. The reaction between acid and base to produce salt and water is called…..
   (a) Condensation reaction
   (b) Oxidation reaction
   (c) Substitution reaction
   (d) Neutralization reaction
4. Carbon exists in two allotropic forms namely:
   (a) Coalter and coal gas
   (b) Water and gas
   (c) Graphite and diamond
   (d) Coal and coke
5. Alkanes are known as paraffins because
   (a) They are hydrocarbons
   (b) They consist of only single bonds
   (c) They are saturated and linear in nature
   (d) They are very reactive

6. Organic chemistry is better defined as chemistry of

   (a) Carbon compounds

   (b) Carbon and hydrogen

   (c) Hydrocarbons

   (d) Hydrocarbons and their derivatives

7. Carbon forms strong single, double and triple bonds between it own atoms – a phenomenon known as

   (a) Conjunction

   (b) Condensation

   (c) Catenation

   (d) Isomerism

8. …….. is herero-atom or a group of heteroatoms in a molecule, which determines the physical and chemical properties of an organic compound.

   (a) Homologous series

   (b) Functional group

   (c) Transition series

   (d) Electronegativity

9. The ability of carbon to exist in various forms in the same physical state is known as……..

   (a) Allotropy

   (b) Hybridization

   (c) Carbonization

   (d) Decomposition

10. Compounds having double bonds in their molecule are usually.

   (a) SP hybridized

   (b) SP^2 hybridized

   (c) SP^3 hybridized

   (d) SP^3d hybridized

APPENDIX G

Marking scheme for 1st C.A

(1) B

(2) A

(3) D

(4) C

(5) C

(6) D

(7) C

(8) B

(9) A

(10) B

Total marks = 10 marks

APPENDIX H

TEACHER MADE TEST FOR 2ND C.A

1. The formula of a compound, which gives the simplest ratio of the number of atoms present in a molecule of the compound is called ……..

   (a) Structural formula

   (b) Molecular formula

   (c) Emperical formula

   (d) General formula

2. A Phenomenon in which a mixture of two structurally different molecules are in rapid dynamic equilibrium as a result of a proton shift from one atom to another within the molecules known as…….

   (a) Catenation

   (b) Toutomerism

   (c) Resonance

   (d) Mesomeric effect

3. Catalytic hydrogenetion of oils results in the production of.

   (a) Soaps

   (b) Detergents

   (c) Alkanes

   (d) Margerine

4. Which of the following is not correct for glucose and fruitose?

   (e) are structure isomers

   (f) reduce fehlings solution

   (g) can be obtained by the hydrolysis of starch

   (h) are readily fomented by enzymes

5. Which of the following formulae is that of a dicarboxylic acid

   (a) $(CH_3CH_2)_2$ CHCOOH

   (b) $CH_2(OH)_2$

(c) $CH_3CH(OH)COOH$

(d) $CH_2(COOH)_2$

6. An organic compound which reacts readily with bromine to form a compound with the formula $CH_3CHBrCH_2Br$ is

(a) Ethene

(b) Propane

(c) Butance

(d) Propene

7. Methanol is obtained from wood by

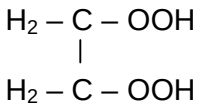
(a) Esterification

(b) Bacterial decomposition

(c) Destructive distillation

(d) Fractional distillation

8. Which of the following is correct about the compound represented below?



(a) Its basicity is 4

(b) It is a dicarboxylic acid

(c) Its boiling point is higher than that of the corresponding alkane

(d) It reacts with alkanols under suitable conditions.

9. Examples of polymers include the following except.

(a) Starch

(b) Nylon

(c) Wool

(d) Glass

10. An alkene may be converted to an alkane by

(a) Halogenation

(b) Hydrolysis

(c) Dehydration

(d) Hydrogenation

APPENDIX I

Marking Scheme for 2nd C.A

(1) C

(2) B

(3) D

(4) D

(5) D

(6) D

(7) C

(8) A

(9) D

(10) D

Total marks = 10 marks

APPENDIX J

T.M.T for 3rd C.A

(1) Which of types of hybridization gives rise to tetrahedral molecules.

(a) SP

(b) SP^2

(c) SP^3

(d) SP^3d

(2) Detergents are better than soaps for laundry because?

(a) Detergents are synthetic while soaps are not

(b) Detergents are more soluble in water than soaps.

(c) Scum is precipitated when soaps are used with hard water but not with detergents.

(d) Soaps form soluble salts with ions causing hardness of water while detergents do not.

(3) Which of the following compounds is Aromatic.

(a) Benzene

(b) Cycldobutane

(c) Hexane

(d) Ethane

(4) The empirical formula of a hydrocarbon containing 0.12 mole of carbon and 0.36mole of hydrogen is

(a) CH_2

(b) CH_3

(c) C_2H_2

(d) C_2H_4

(5) Which of the following compounds is use as anaesthetic?

(a) CHI_3

(b) $CHCl_3$

(c) $CHBr_3$

(d) CH_3OH

(6) Which of the following statement is not correct?

(a) Carbon exhibits allotropy

(b) Sulphur exhibits allotropy

(c) Chlorin exhibits allotropy

(d) Nitrogen is a gas

(7) Which of the following statement best explains cracking? It is a process

(a) In which an alkene adds on itself repeatedly to form long chain polymer's

(b) In which large hydrocarbon molecules are broken into small units

(c) For measuring the octane number of petrol

(d) In which aromatic hydrocarbons are produced.

(8) Which of the following hydrocarbon is not likely to be present in petrol?

(a) $C_{14}H_{30}$

(b) $C_{10}H_{22}$

(c) C_9H_{20}

(d) C_7H_{16}

(9) The following are miscible with water except

(a) enthylethanoate

(b) methanol

(c) ethanoic acid

(d) methanoic acid

(10) How many carbon atoms are there in benzene ring?

(a) 4

(b) 5

(c) 6

(d) 7

APPENDIX K

Marking scheme for 3rd C.A

(1) C

(2) C

(3) A

(4) B

(5) B

(6) C

(7) B

(8) A

(9) A

(10) C

Total marks = 10 marks

APPENDIX L

T.M.T for 4th C.A

(1) Which of the following formulae is that of a dicarboxylic acid

(a) $(CH_3CH_2)_2CHCOOH$

(b) $CH_2(OH)_2$

(c) $CH_3CH(OH)COOH$

(d) $CH_2(COOH)_2$

(2) Which of the following is not a direct petroleum product.

(a) Methane

(b) Ethanol

(c) Kerosene

(d) Vaseline

(3) An organic compounds which reacts readily with bromine to form a compounds with the formula $CH_3CHBrCH_2Br$ is

(a) Ethane

(b) Propane

(c) Butane

(d) Propane

(4) Methanol is obtained from wood by

(a) Distructive distillation

(b) Esterification

(c) Bacterial decomposition

(d) Combustion

(5) The reactions of ethyne are mainly

(a) Substitution reaction

(b) Addition reaction

(c) Addition polymerization

(d) Catalytic hydrogenation

(6) When sucrose is warmed with fehlings solution

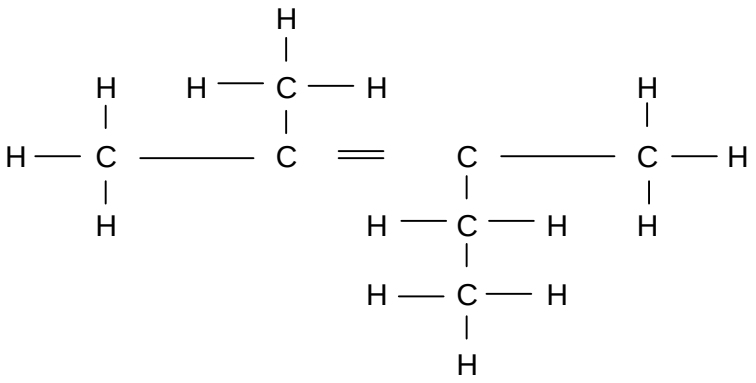
(a) A silver mirror is produced

(b) The solution turns milky

(c) A brick red precipitate is formed

(d) There is no precipitate

(7) What is the name of the compound with the following structure



(a) 2,3 – dimethylpent – 2 – ene

(b) 1,1 – dimethyl 2 – ethyl prop – 2 – ene

(c) 2,3 – dimethyl pentane

(d) 1,1, - dimethyl, 1 – ethylprope – 1 – ene

(8) Vulcanization of rubber

(a) Decrease the elasticity of the rubber

(b) Hardens the rubber through cross – linkages

(c) Removes sulphur from the rubber

(d) Stops the growth of fungs on the rubber

(9) The product of the reaction between propanoic acid and ethanol is

(a) ethyl propanoate

(b) propyl methanoate

(c) ethyl ethanoate

(d) methyl propanoate

(10) The formula (CH3) COH ios that of a

(a) Polyhydric alcohol

(b) Secondary alcohol

(c) Tertiary alcohol

(d) Trihydric alcohol

Appendix M

Marking scheme for T.M.T 4th C.A

(1) D

(2) A

(3) D

(4) A

(5) B

(6) D

(7) A

(8) B

(9) A

(10) C

Total marks = 10 marks

APPENDIX N

ANOVA TO DETERMINE THE EQUIVALENCE OF THE FOUR GROUPS

Post Hoc Tests
Homogeneous Subsets
PRE-TEST
Duncan[a]

GROUP	N	Subset for alpha = 05
		1
D	25	2.8800
B	25	3.3200
A	25	3.3600
C	25	3.9600
Sig.		.135

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 25.000

One way

ACHIEVEMENT **Descriptives**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for mean	
					Lower Bound	Upper Bound
C	30	18.0000	4.9480	.9034	16.1524	19.8476
E1	30	24.0333	5.4170	.9890	22.0106	26.0561
E2	30	29.3000	7.6029	1.3881	26.4610	32.1390
Total	90	23.7778	7.6110	.8023	22.1837	25.3719

ACHIEVEMENT **Descriptives**

	Minimum	Maximum
C	5.00	30.00
E1	12.00	32.00
E2	15.00	45.00
Total	5.00	45.00

Achievement **ANOVA**

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	1918.289	2	959.144	25.777	.000
Within Groups	3237.267	87	37.210		
	5155.556	89			

Post Hoc Tests

APPENDIX O

List of items and difficulty Index

Item	
(1) 10	85%
(2) 26	15%
(3) 27	17%
(4) 28	19%
(5) 33	19%
(6) 37	92%
(7) 40	79%

APPENDIX P

Post – test Scores for E1, E2 and C

	C	E1	E2
1.	20	30	39
2.	21	28	28
3.	17	16	40
4.	19	25	31
5.	18	19	28
6.	22	22	45
7.	19	31	37
8.	08	20	19
9.	16	26	33
10.	20	27	25
11.	15	22	37
12.	19	29	20
13.	23	30	19
14.	05	12	29
15.	13	16	30
16.	19	18	32
17.	11	19	28
18.	30	23	29
19.	23	25	30
20.	17	31	33
21.	16	32	34
22.	19	20	25
23.	20	28	36
24.	19	32	40
25.	16	18	15
26.	16	28	30
27.	15	27	22
28.	25	22	16
29.	24	20	30
30.	15	25	19

APPENDIX Q

Post test scores for males and females in the 1st experimental group E1

S.No	Males	Females
1.	30	25
2.	16	30
3.	25	19
4.	22	26
5.	31	27
6.	20	12
7.	25	18
8.	22	19
9.	29	25
10.	30	31
11.	16	28
12.	23	32
13.	20	27
14.	17	22
15.	28	20

APPENDIX R

Post – test scores for Males and Females in the 2nd experimental group E2

S.No	Male	Female
1.	30	28
2.	31	40
3.	28	19
4.	45	33
5.	37	25
6.	37	20
7.	30	19
8.	28	29
9.	29	30
10.	33	32
11.	34	16
12.	25	22
13.	36	40
14.	30	40
15.	25	30

APPENDIX S

C.A and Exam scores for the 1st experimental group E1

S.No	C.A. Scores	Exam scores
1.	22	30
2.	30	28
3.	18	16
4.	22	25
5.	22	19
6.	22	22
7.	20	31
8.	18	20
9.	18	25
10.	18	26
11.	10	27
12.	18	22
13.	20	29
14.	14	30
15.	20	12
16.	20	16
17.	30	18
18.	10	19
19.	22	23
20.	10	25
21.	20	31
22.	12	20
23.	22	28
24.	28	32
25.	16	17
26.	22	28
27.	20	27
28.	22	22
29.	22	20
30.	14	32

APPENDIX T

C.A and exams scores for the 2nd experimental group E2.

S.No	C.A	Exam
1.	29	39
2.	21	28
3.	17	40
4.	15	31
5.	18	28
6.	19	45
7.	22	19
8.	15	33
9.	21	25
10.	20	37
11.	27	20
12.	22	37
13.	27	20
14.	24	29
15.	17	30
16.	26	29
17.	22	33
18.	21	25
19.	23	16
20.	17	22
21.	27	30
22.	24	30
23.	22	33
24.	21	34
25.	21	25
26.	21	36
27.	24	40
28.	18	14
29.	13	32
30.	21	30

APPENDIX U

Pre – test for the four groups

S. No	A	B	C	D
1.	03	03	03	01
2.	05	02	04	01
3.	02	01	05	02
4.	01	06	09	03
5.	04	05	02	05
6.	00	08	05	04
7.	05	06	04	05
8.	02	03	03	02
9.	00	05	04	04
10.	03	04	03	01
11.	04	03	02	00
12.	01	01	00	05
13.	10	01	01	03
14.	06	02	06	04
15.	07	00	08	02
16.	08	04	05	01
17.	00	06	00	00
18.	05	04	07	06
19.	03	03	06	04
20.	04	02	09	03
21.	05	06	01	01
22.	03	01	04	05
23.	02	04	00	04
24.	01	03	03	02
25.	00	00	05	04
26.	03	07	01	05
27.	04	06	02	04
28.	05	05	03	03
29.	06	04	04	02
30.	07	02	05	01