

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Naturally, every human being strives to achieve excellence. The need to ascertain how well an individual, personnel, school, student or teacher is doing at one point or the other in an area of endeavour is of importance to those who are interested in achieving excellence. Assessment is necessary because it is likely to enable people and organizations to discover better ways of doing things; discover their weaknesses and strengths and also improve on their effectiveness. When an assessment is carried out on students, teachers, administrators or the school, more light is shed on ways of improving standards and attaining the set goals. Thus, assessment is regarded as a process of collecting, synthesizing and interpreting information in order to make decisions on students' performance. Assessment can be conducted in the class to diagnose students' problems, to judge their academic performance, to provide feedback to students and to plan instruction (Gunawardena, 2010). Joyce, Spiller and Twist (2009) defined assessment as collecting information on students' learning or performance based on various sources of evidence.

Boud (2003) opined that the "defining characteristic" of self-assessment is the involvement of students in identifying standards or criteria to apply to their work and making judgements

about the extent to which they have met these criteria and standards. Self-assessment therefore sits within the bigger picture of self-regulation, which Zimmerman (2001) described as students being metacognitive, motivationally and behaviourally active participants in their own learning.

Teaching students to assess themselves may facilitate the achievement of instructional objectives and improve learning outcomes. During self-assessment, students are motivated to participate actively in the management of their own affairs. Students learn to assess themselves, thus giving students some control over what is learned and assessed and also contributing to their learning record (Egbochuku, Ekoja&Ekoja, 1999). Engaging students in self-assessment enhance their ability to learn independently, thereby performing better (Adediwura, 2012).

There are three main purposes of self-assessment. It could be used as an educational outcome, a learning strategy and an assessment tool (Gunawardena, 2010). Self-assessment serves as an educational outcome when teacher-made achievement test is administered on students after a given period of instruction to ascertain how well students have performed. As a learning strategy, self-assessment equips the learner to monitor his strengths and weaknesses against set standards and determine how to improve on his learning. So, the learner is able to reflect on his actions, abilities and feelings. Self-assessment serves as an assessment tool

when it is formative (on-going, that is, during the course of a lesson) or summative (at the end of a period of instruction). When self-assessment is summative, students mark their own work from an answer sheet and there is no expectation on the students to use the assessment to improve their learning. However, when it is formative, it is called ‘assessment-for-learning’ and the purpose is to move the students closer to a goal or standard. When learners partake in the assessment of their learning, self-assessment not only gives them a sense of belonging but helps them to know their strengths and weaknesses (Joyce, Spiller & Twist, 2009). The student’s knowledge of his limitations will make him to direct his efforts to what has to be learned and hence, improve academic achievement. A classroom culture where students are not passive, but active has to be developed before self-assessment can become an effective part of students’ learning, particularly in science and technology. In order to prepare future Nigerian citizens for learning throughout life, that is, students who are not totally dependent on the teacher; student self-assessment may be practised in the science class as Chemistry happens to be key to the industrial and agricultural development of any country.

Chemistry is the systematic study of elements and the changes they undergo under different conditions. There is virtually nothing in the world that is not Chemistry. The knowledge of Chemistry finds its application in virtually all facets of human endeavour. Chemistry is applicable in food preservation, medicine and housing. Chemical products of fractional distillation of crude oil (petrol, diesel, asphalt and bitumen) are useful in the transportation

industry. Secondary School Chemistry affords the students the opportunity to acquire the necessary skills, attitudes, knowledge and competencies for a solid foundation in the subject. Apart from its relevance to national development, it is also of paramount importance to career choice at the personal or individual level- in teaching, engineering, medicine and textile industry. The scientific and technological breakthrough that Nigeria yearns for may never be achieved if secondary school students do not excel in this subject. Hence, they may be unable to apply the knowledge in meeting human needs and contributing to Nigeria's technological and economic growth. However, students' results consistently remained poor.

The May/June Senior School Certificate Examination (SSCE) WAEC Chief Examiner's Report (2008) recommended that the appropriate authority in the education sector should address critical issues in Chemistry such as the teaching strategy, learning environment, required teaching aids, appropriate number and quality of teachers. The results of students in Chemistry in the May/June Senior School Certificate Examination for fifteen consecutive years, from 2001 to 2015 as shown in Table 1 are evidence of poor achievement in Chemistry.

Table 1: Performance of Chemistry Students in the May/June West African Examinations Council (WAEC) Senior Secondary School Certificate Examination. 2001 – 2015.

| YEAR | % CREDIT (A ₁ -C ₆) | % PASS (D ₇ – E ₈) | % FAIL (F ₉) |
|------|---|--|-----------------------------|
| 2001 | 36.26 | 27.07 | 36.67 |
| 2002 | 31.43 | 29.48 | 39.09 |
| 2003 | 50.9 | 25.26 | 23.84 |
| 2004 | 41.47 | 25.51 | 33.02 |
| 2005 | 50.95 | 18.77 | 30.28 |
| 2006 | 44.16 | 25.73 | 30.11 |
| 2007 | 45.88 | 24.76 | 29.36 |
| 2008 | 44.21 | 27.41 | 28.38 |
| 2009 | 43.22 | 27.33 | 29.45 |
| 2010 | 50.31 | 24.61 | 25.08 |
| 2011 | 49.54 | 24.23 | 26.23 |
| 2012 | 41.6 | 28.43 | 29.97 |
| 2013 | 27.95 | 36.03 | 36.03 |
| 2014 | 38.12 | 30.9 | 30.04 |
| 2015 | 59.59 | 20.3 | 20.11 |

Source: West African Examination Council 2001 to 2015 Annual Report.

Evidence from Table 1, shows that students' performances fluctuated over the years. There was an average of 43.70% credit level passes (A₁-C₆) while a greater percentage (56.23%) did not meet the criterion. The D₇-F₉ category of students may not be able to contribute to Nigeria's technological growth and development through Chemistry knowledge.

Diverse teaching strategies and instructional materials may have been used by science teachers to improve learning in Chemistry and performance in public examinations. However, the percentage of students with credit level passes continues to fall below expectations. This therefore, necessitates an investigation into whether students' self-assessment would result in better student learning-outcome in Chemistry. It is also possible for students' self-assessment to reduce examination malpractice which has remained a monster in the school system.

Students may engage in examination malpractice in order to avoid failure. Thus, equipping them with self-assessment skills may help them to be confident and well prepared for examinations thereby improving learning outcome. Acquisition of student self-assessment skills may likely discourage engagement in cheating at examinations in Nigeria. All over the world, examination remains a popular yardstick for ascertaining how well a learner has attained after a certain period of instruction (Aderogba&Olatoye, 2012). They asserted that examination can take the form of paper and pencil test, oral test, practical test or electronic test. Examination malpractice occurs when the test taker either solely or in full cooperation with parents and/or authorities engages in activities that contravene the rules and regulations guiding the conduct of an examination. Examination malpractice questions the credibility of examinations conducted generally and the certificates issued thereafter. Impersonation, use of mobile phones, 'use of chips' are only but a few methods used in committing examination

malpractice. Examination malpractice is not peculiar to Nigeria alone, but it is also common in other countries of the world. In India, Maheshwari (2011) described cheating in Indian schools and colleges as a “contemporary shame”. Students engage in examination malpractice because they want to achieve success. Teachers are involved in this menace because of financial, material and intangible gains. Parents indulge in this because they want good grades for their wards (Maheshwari, 2011).

An American research carried out by the Centre for Academic Integrity (CAI, 2005) showed that 74% of some four thousand five-hundred (4,500) high school students admitted to serious test cheating while 97% confessed to copying either homework. In 2003, the Examination Ethics Project in Nigeria reported that out of nine hundred and twenty-nine thousand, two hundred and ninety-four (929,294) candidates, 111,980 representing 12.05 per cent were caught cheating in examinations. In Nigeria, between 1996 and 2005, a total of fourteen million, four hundred and eight thousand, three hundred and thirty-six (14,408,336) candidates sat for SSCE and one million three hundred and sixty-seven thousand, seven hundred and twenty-six (1,367,726) of them, representing 9.4% over that period were involved in examination malpractice. This means that for every hundred (100) candidate who sat the examination, about 10 of them cheated (WAEC, 2006). Many reasons have been adduced as being responsible for this phenomenon, among which is the students’ attitude.

A student's attitude may play a vital role in his tendency to get involved with cheating during examinations. Attitude is a predisposition to respond favourably or unfavourably towards people or objects. Attitude is the way an individual acts and behaves (Yara, 2009). Attitude can be appropriate or inappropriate. Appropriate attitudes promote effective and acceptable behaviours and feelings of happiness and satisfaction while inappropriate attitudes promote self-defeating behaviours like examination malpractice, anger, depression and anxiety (Okoli, 2005). Yara (2009) opined that attitude has serious implications for the student, teacher and the school system. Attitudes can be acquired through learning experiences. Since attitude as a psychological disposition could be positive or negative, it marks out human beings as individuals in their interaction with the environment (Isichei&Ubangha, 2004). They declared that favourable or unfavourable attitude always refer to a person, situation or an object. It is paramount in success or failure of an individual within a social environment. Attitudes are made up of both emotional elements (like and dislike) and cognitive elements that identify the object's qualities.

In human beings, since attitude is an inner disposition of will and intellect, there is this dilemma as to when to have positive attitude and be successful and not negative attitude and avoid failure. Isichei and Ubangha (2004) asserted that there is nothing to gain for negative attitude (to a good thing) but there is always something to gain with positive attitude (to a good thing). Positive and favourable attitudes tend to be long lasting and lead to action while

a negative attitude leads to an inactive disposition. An example of the gain of positive attitude to things is that an individual lives with joy, freedom and peace. A person's attitude may be concealed, that is, not observable but could be inferred from the behaviour, the responses, utterances or physiological signs the individual exhibits (Alade, 2007). Attitude of students are measured here to predict how they will act in a given situation towards a person, group of people or something. This is the reason an understanding of a student's attitude towards examination malpractice is of importance to the educator.

A student's attitude towards examination malpractice can either be positive or negative. If students could develop a negative attitude towards cheating at examinations, then examination malpractices can be reduced to a minimum. Perhaps, involvement in self-assessment may lead to better students' self-knowledge resulting in self-confidence and the development of a negative attitude to examination malpractice. This study aimed at ascertaining whether involvement in students' self-assessment would influence students' attitude to examination malpractice. Apart from looking at this issue from the students' perspective, the role of the teacher as a catalyst for achieving student self-assessment also remains a non-negotiable variable. This is the reason, the National Policy on Education (Federal Government of Nigeria, 2013), asserted that education is a tool for national development and that no educational system can develop beyond the quality of its teachers as good quality teachers may give 'birth' to excellent students. The qualities that teachers

possess go a long way to determine the quality of education and the extent to which goals of the National Policy on Education are achieved. Hence, this study investigated the effects of Students' self-assessment on Learning Outcome of Chemistry students and their Attitude to Examination Malpractice in Ogun State Secondary Schools.

1.2 Statement of the Research Problem

The study of Chemistry is very important because of its application to all walks of life. Chemistry is a core science subject and students' performance should be of interest to stakeholders in education. Success in Chemistry is crucial to the attainment of scientific and technological breakthrough in Nigeria. The poor performance of students in the science subjects, (especially Chemistry) has been attributed to factors such as: poor quality of methods of teaching which includes excessive teacher talk, rote learning of text book materials and copying of notes which tends to inhibit the interest of students. The use of expository method of teaching (which is teacher-centred) rather than inquiry, with little or no involvement of students in experiments and lack of laboratory equipment for practical work contribute to poor results. If poor performance continues, many students will be unable to meet the entry requirements for admission into tertiary institutions to study science and technology related disciplines. The nation's quest for scientific and technological development may become a mirage. Nigeria's economy may not experience any meaningful growth without scientific and technological development. Progress made by the tutors

towards scientific development and to meet the Millennium Development Goals (MDG), now Sustainable Development Goals and targets and the goals of the National Policy on Education will be wasted if this trend is not checked. The chief examiner's report (WAEC, 2008) on the Senior School Certificate Examination (SSCE) has consistently reported poor achievement in this subject. This therefore, necessitated the use of student self-assessment as a measure to combat poor performance problems in Chemistry.

The Federal Government of Nigeria has tried to encourage the learning of science especially Chemistry because of its application to human needs (Imhanlahhimi&Aguele, 2006). Chemistry teachers mainly adopt instructional strategies that are teacher directed and do not encourage deeper students involvement and self-regulation (Zimmerman, 1990). The expository method is the commonest teaching strategy employed by most science tutors even in the teaching of Chemistry. It is a method of instruction that renders the learner passive and therefore yielding poor results at examinations. Learning is a personal experience that requires active and dedicated participation of the learner. Self-assessment strategy makes the learner self-propelled, independent and responsible for his own learning. Therefore, this study is interested in changing the trend in poor Chemistry results by equipping students with self-assessment skills which would empower them to become active, goal-oriented and self-corrective learners; who take responsibility for their own learning. When students do not take

active part in their learning they tend to seek ways of excelling by engaging in examination malpractices.

Examination malpractice is another serious problem plaguing Nigerian schools. Cheating questions the credibility of examinations conducted in Nigeria and the certificates issued thereafter. Indulging in examination malpractice has negative effects on the economic, social and technological potentials of an individual and the country in general. This means that certificates and documents from Nigeria may be treated with suspicion or discriminated against. People who are unable to defend their certificates may face the embarrassment of being dismissed from their jobs. Severe consequences of procuring certificates through examination malpractice manifest in economic sabotage, bank frauds, manufacture of fake drugs, kidnapping, building collapse, vandalism and hard drug trafficking. Such people, who pass examinations through cheating, are likely to rig to win electoral polls, cheat on their spouse and steal from an employer. If students are not well taught and or not properly prepared for an examination, they may resort to cheating in order to pass examinations. Hence, this study focused on ascertaining whether acquisition of students' self-assessment skills would enhance learning outcome of Chemistry students in schools and curb examination malpractice.

1.3 Theoretical Framework

This research work was hinged on the following theories:

- Vigotsky's Social Development Theory.
- Jean Piaget's Theory of Cognitive Development.
- Attitudinal Theory of Planned Behaviour and Reasoned Action.
- True Score Theory.

Vigotsky's Social Development Theory

The theory states that social interaction precedes development; consciousness and cognition are the end products of socialization and social behaviour (Vigotsky, 1978). Lev Vigotsky (1896-1934) was a Russian psychologist who lived during the Russian Revolution. Vigotsky's Social Development Theory was first published in 1962. The theory is one of the foundations of constructivism. Vigotsky's theories stress the fundamental role of social interaction in the development of cognition, as he believed strongly that community plays a central role in the process of deriving meaning. Vigotsky argued that learning is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function (Vigotsky, 1978). In other words, social learning tends to precede development.

Vigotsky's Theory asserts three major themes, namely:

- Social Interaction.
- More Knowledgeable Other (MKO).

- Zone of Proximal Development (ZPD).

Social Interaction: Vigotsky opines that social interaction plays a major role in cognitive development. He stressed that social learning precedes development. This contrasts with Jean Piaget's Theory of child development in which development necessarily precedes learning. The theory states that: "every function" in a child's cultural development appears twice; first on the social level and later on the individual level. The first is between people, that is, inter-psychological and then inside (intra-psychological) the child (Vigotsky, 1978).

The More Knowledgeable Other (MKO): Here, MKO refers to anyone who has a better understanding or higher ability than the learner with respect to a particular task, process or concept. The more knowledgeable other is a teacher, coach or an older adult. The MKO could also be a younger person, peers, or even computers.

The Zone of Proximal Development: The zone of proximal development (ZPD) is the distance between a student's ability to perform a task under adult guidance and/or with peer cooperation and the student's ability to independently solve the problem. According to Vigotsky, learning occurred in this zone.

Vigotsky focused on the connections between people and the sociocultural context in which they act or interact in shared experiences. He went on to say that humans use tools from their

culture such as speech and writing, to agree with their social environments. Children initially develop these tools (speech and writing) to mainly serve as social functions, that is, ways of communicating their needs. Vigotsky (1978) believed that the internalization of these tools led to higher thinking skills.

Vigotsky placed strong emphasis on activity as basis for learning and emphasised communication and social interaction where teachers (adults or more experienced peers) retain varying degree of influence over a child's learning activities. The teacher's intervention is seen as a 'scaffolding' process that makes it possible for a child/novice/student to solve a problem beyond his unassisted efforts (Orsmond, 2004). Scaffolding is a process whereby the teacher continually adjusts the level of his help in response to the child's level of performance. Scaffolding is an effective form of teaching as it not only produces immediate results, but instils skills necessary for independent problem solving in future.

The theory of Vigotsky is of immense relevance to student self-assessment because it places strong emphasis on activity as the basis for learning. The teacher's intervention in the learning environment enables the learner to solve a problem beyond his unassisted efforts. In order for students to achieve more success in Chemistry, the teaching and learning of Chemistry should be activity-based. Involving students in a lot of activities in class and laboratory enable them to be more "analytic"; the more analytic a student is, the better he

performs (Ilogu&Adebisi, 2004). Hence, student self-assessment is a strategy which empowers students to be active, goal-oriented learners who take responsibility for their own life-long learning. That is, under the guidance of their teacher (More Knowledgeable Other). The relevance of this theory is that students discover their strengths and weaknesses (under varied guidance of the teacher) and then make up for their shortcomings.

Jean Piaget's Theory of Cognitive Development

Jean William Fritz Piaget was born on 9th August 1896 at Neuchatel, New York and died 16th September 1993, in Geneva, Switzerland at the age of 97. He was a French-speaking Swiss Developmental Psychologist and Philosopher known for his epistemological studies with children. His theory of cognitive development finds its relevance in the study of student self-assessment. He taught at the Grange-Aux-Belles School for boys in Paris, France (run by Alfred Binet) after his graduation from the University of Zurich. Jean Piaget's interest in children started while he assisted Alfred Binet, the developer of Binet's intelligence test to mark some of these tests when he noticed that young children consistently gave wrong answers to certain questions. His focus was not on the wrong answers, but that the children consistently made mistakes older children and adults did not make. This led him to the theory that the cognitive processes of children were basically different from those of adults. So he proposed the theory of cognitive development; in which he showed common patterns

of cognition in each stage of development of an individual. Four stages of cognitive development were identified.

Stages of Cognitive Development

- Sensorimotor stage.
- Preoperational stage.
- Concrete operational stage.
- Formal operational stage.

Sensori Motor Stage

This stage occurs from birth to two (2) years. During this stage children use their five senses to explore the world. Children see the world from only their own point of view; that is, they are extremely egocentric. This stage is divided into three sub-stages namely: simple reflexes (like, sucking of the thumb); first habits and primary circular reactions (for instance, following object with eyes and losing interest when object disappears); secondary circular reactions (for example, extension of coordination ability to other objects in the environment); coordination of secondary circular reactions (like, development of object permanence and constancy); tertiary circular reactions (exhibiting inventiveness in coordinating abilities), novelty and curiosity; and internalization of schemes.

Preoperational Stage(Ages 3 to 7 years).

Children engage in magical thinking at this stage. Motor skills are also acquired by the children. Egocentrism becomes strongly manifested and then weakens. Children are unable to do logical thinking.

Concrete Operational Stage

This occurs from ages 7 to 11. Children start to think logically at this stage but are very concrete in their thinking. They begin to conserve and think logically only when practical aids are used. Manifestation of egocentrism stops.

Formal Operational Stage

This stage of cognitive development starts from 11 to 16 years of age and onwards. At this stage the children develop the ability to do abstract reasoning. They can easily conserve and think logically in their minds.

Application of Piaget Cognitive Development Theory to Learning

Piaget's theory is concerned with the idea of developmentally appropriate education. This is an education in which the environment, curriculum materials and instruction are suitable to students in terms of their physical, cognitive, social and emotional needs. Piaget was of the belief that children's development must as a matter of necessity precede their learning.

The educational implications are summarized thus:

- Teachers should pay attention to children's thinking not just the product. This implies that, teachers should not only check for the correctness of children's answer but

ascertain the processes children use to get to the answer. Learning experiences build on a child's current level of cognition and it is only when the teacher tries to appreciate the child's method of getting a particular conclusion that the teacher can provide appropriate learning experiences.

- Piaget de-emphasized ready-made knowledge in the classroom but encourages the teacher to provide a rich variety of activities that permit children to act directly on the physical world and discover things for themselves through spontaneous interaction with the environment. Teaching method should not be didactic. This implies that the teacher should provide variety of activities for the learner to be engaged in.
- The Piagetian classroom discourages educational practices that are aimed at making children adult like in their thinking. That is, speeding up cognitive development by premature teaching leads to superficial understanding of adult formulas instead of true cognitive understanding. Piaget was of the belief that premature teaching could be worse than no teaching at all.
- Piaget made the assumption that all children go through the same developmental sequence but at different rates. So teachers should endeavour to arrange classroom activities for individuals and small groups of children rather than the entire class group. Also, teachers should assess children based on their level of cognitive development rather than by the standard of performance of same age peers.

Assessment of the learner's educational progress should be in terms of each child's own previous pattern of development and not in terms of prescriptive standards.

Jean Piaget's theory of cognitive development is relevant to student self-assessment training because Piaget placed strong emphasis on activity as the basis for learning and that practical concrete experiences are important for cognitive development. Student self-assessment strategy provides the basis for such learning activities, where the curriculum materials, environment and instruction suit the students' cognitive, physical, emotional and social needs. In order for students to achieve more success in Chemistry, the teaching and learning of Chemistry should be activity-based. It should be noted that Piagetian theory stresses that practical concrete experiences are important for cognitive development. The role of concrete experience, with social and cultural influence in learning is very relevant to self-assessment. Piaget was of the view that children constructed their own learning. According to Piaget, genuine intellectual development is largely due to the child's unassisted activities. Hence, Piaget placed strong emphasis on activity as basis for learning and this makes the theory relevant to student self-assessment training in this study.

Attitudinal Theory of Planned Behaviour and Reasoned Action

The theory of planned behaviour states that attitude toward behaviour, subjective norms and perceived behavioural control together influence an individual's behavioural intentions and behaviours. The theory of planned behaviour shows the link between attitude and behaviour. It was proposed by Ajzen (1985) as an extension of the theory of reasoned action which was proposed by Fishbein (1975). According to the theory of reasoned action, if a person evaluates the suggested behaviour as positive (attitude), and if the person thinks his or her significant other wants him to perform the behaviour (subjective norm), this results in a higher intention (motivation) and they are more likely to do so. There may be a high correlation of attitudes and subjective norms to behavioural intention and subsequently to behaviour.

Concepts of major variables

Behavioural beliefs and attitude toward behaviour

- **Behavioural belief:** This is an individual's belief about consequences of particular behaviour. The concept is based on the subjective probability that the behaviour will produce a given outcome.
- **Attitude toward behaviour:** This refers to an individual's positive or negative evaluation of self-performance of the particular behaviour. This concept is concerned with the extent to which performance of the behaviour is negatively or positively valued. It is

determined by the total set of accessible behavioural beliefs linking the behaviour to various outcomes and other attributes.

Normative beliefs and subjective norms

- **Normative belief:** This refers to an individual's perception about a particular behaviour. The perception is influenced by the judgment of significant others like parents, spouse, friends and teachers.
- **Subjective norm:** Means an individual's perception of social normative pressures, or relevant others' beliefs that he or she should or should not perform such behaviour.

Control beliefs and perceived behavioural control

- **Perceived behavioural control:** This means the perceived ease or difficulty with which an individual can perform a particular behaviour. It is assumed that perceived behavioural control is determined by the total set of accessible control beliefs.
- **Control beliefs:** This refers to an individual's beliefs about the presence of factors that may impede or facilitate performance of the behaviour. The concept of perceived behavioural control is related to self-efficacy.

Behavioural intention and behaviour

- **Behavioural intention:** This is when an individual indicates readiness to perform a given behaviour. It is assumed to be an immediate antecedent of behaviour. This is based on

attitude toward the behaviour, subjective norm, and perceived behavioural control, with each predictor weighted for its importance in relation to the behaviour and population of interest.

- **Behaviour:** This refers to an individual's observable response in a given situation with respect to a given target. Ajzen (1985) said behaviour is a function of compatible intentions and perceptions of behavioural control. That is, perceived behavioural control is expected to moderate the impact of intention on behaviour. This is so that a favourable intention manifests the behaviour only when perceived behavioural control is strong.

A person's tendency to engage in examination malpractice is premeditated and planned. The attitudinal theory of Reasoned Action and Planned Behaviour is applicable to examination malpractice because there is a link between attitude, intention and behaviour. If a person has a positive (attitude) disposition towards Examination malpractice; this leads to the intention to engage in the act. The intention in turn triggers one to plan for the cheating behaviour during examinations (behaviour).

TRUE SCORE THEORY AND EXAMINATION MALPRACTICE

The true score theory is a simple model for measurement. It is also referred to as the classical test theory because its history could be traced back to Spearman (1904). Measurement is the process of assigning numbers to attributes or characteristics of persons, objects or events according to explicit formulation or rules. The true score theory makes the assumption that any measurement consists of true value and error score. The error score is further subdivided

into random and systematic error. The true score theory is denoted by the following equation:

$$X = T + E$$

Where X = observed score (that is, score awarded by the examiner to represent the student's ability.

T = true score (representing the true or actual ability of the student without mistakes or error).

E = error score (represents the error or mistake) purposely or mistakenly introduced into the measurement process to either inflate or deplete the student's score in any examination.

Random error is caused by factors that randomly affect measurement across the sample. It only inflates or deflates the scores artificially. It does not affect the average performance of the group. Random error is sometimes referred to as "noise".

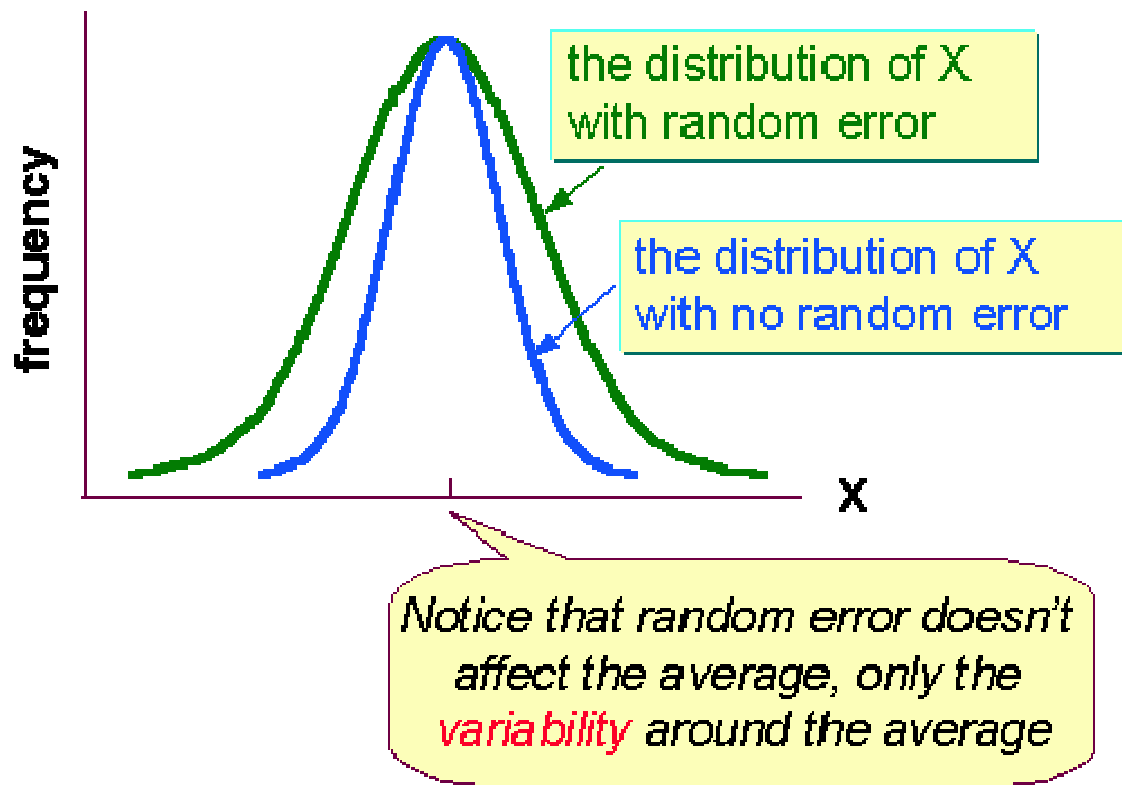


Figure 1: Effect of random error on average performance.

Source: Research Methods knowledge base (2006).

Systematic error is caused by any factor that systematically affects the measurement of the variable across the sample. Systematic error affects the average score. This is referred to as bias.

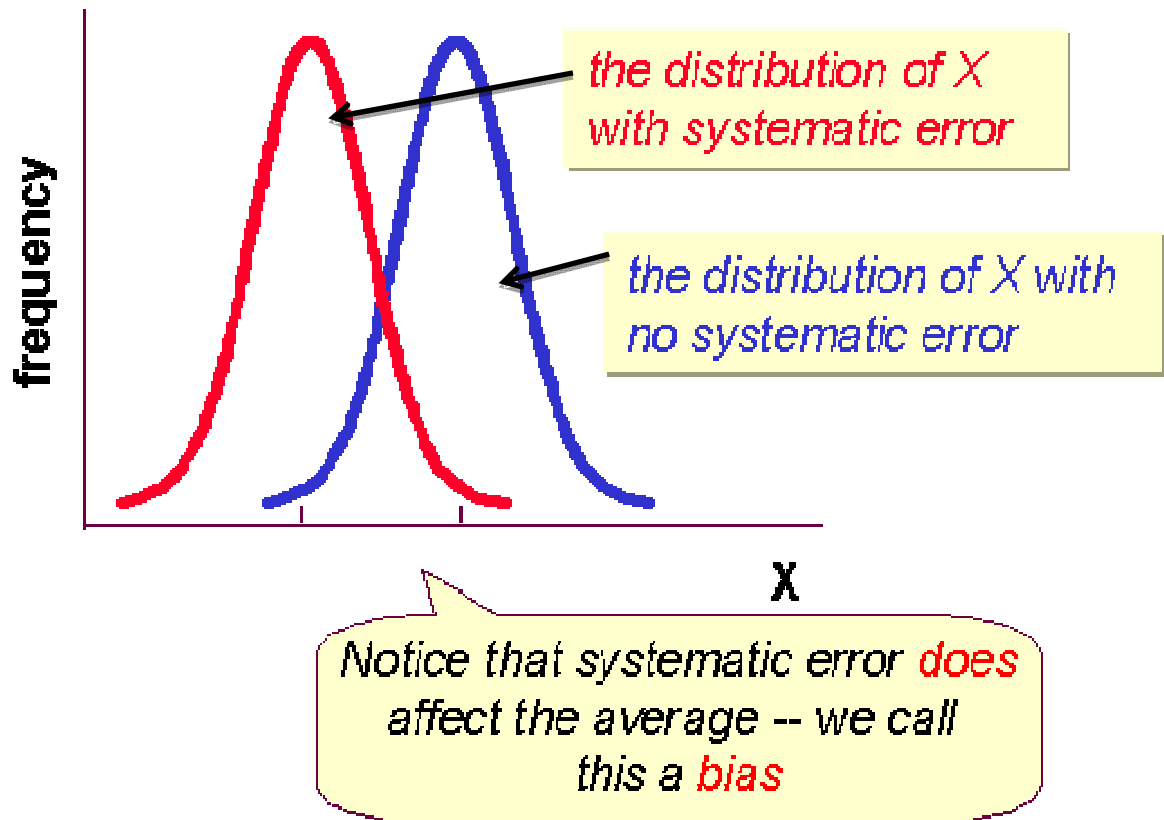


Figure2: Effect of systematic error on average performance.

Source: Research Methods knowledge Base (2006).

From the educational measurement equation above, it is worthy of note that the score which the student does not deserve is embedded in the error score (E). Looking at the equation, we can deduce that, $X - T = E$ (error score). But it is desired that X (observed score) should be close to T (true score) or equal to T . If the error score is zero then, observed score will be equal to the true score, that is, $X = T$. On the other hand, the bigger the value of error score E (due to exam malpractice), the farther away the observed score (X), is from true score (T).

The implication of this is that the higher the value of E, due to examination malpractice, the more the school or WAEC scores deviate from the true abilities of the students who wrote the examination. When a student engages in examination malpractice and his score is very high, the score represents errors due to examination malpractice and not his true abilities. This simply explains why some owners of high scores perform below expectation and are unable to defend their scores.

1.4 Conceptual framework

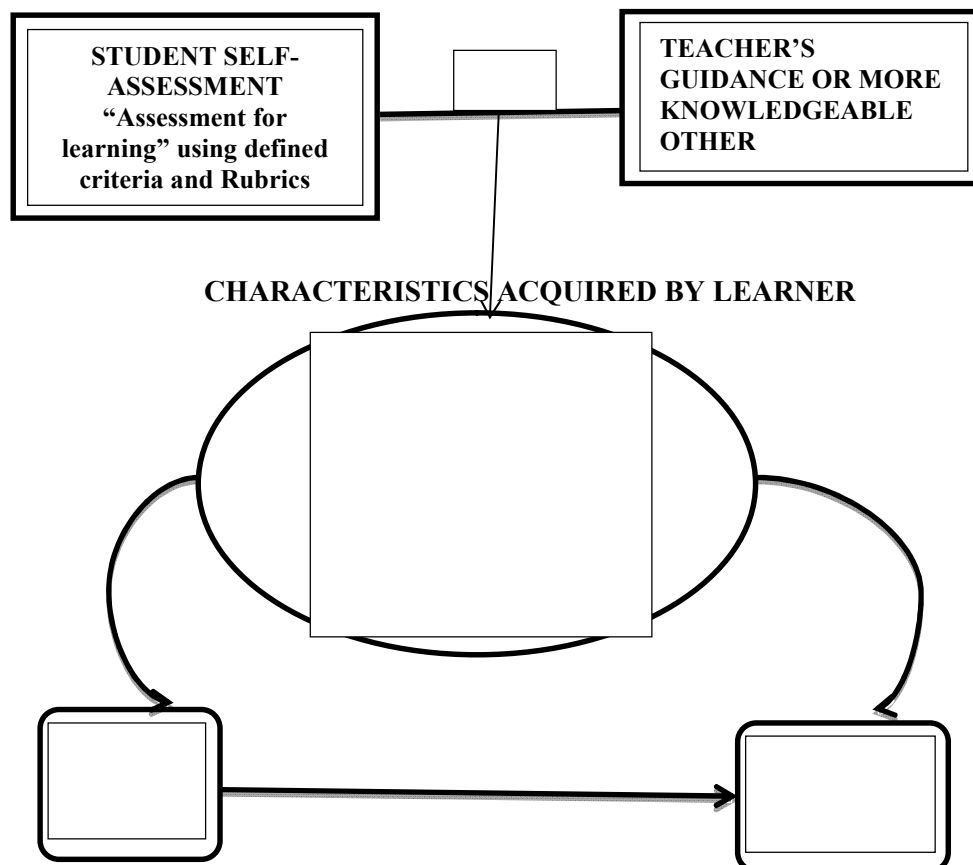


Figure 3: Researcher's Conceptual Framework of variables under study.

The figure shows a researcher designed Conceptual Framework depicting the relationship among the variables in this study. The diagram shows that infusing Student Self-assessment

training into Chemistry lessons using clearly defined criteria and rubrics under the tutelage of a teacher equipped the student to develop certain abilities. The student acquires life-long learning skills, communicative and computational skills. They become active, confident, knowledgeable and independent people who take responsibility for their own learning. All these characteristics improve learning and achievement. A student who is confident and conversant with the subject matter will not engage in examination malpractice. Hence, learning is improved and examination malpractice is curbed.

1.5 Purpose of the Study

The purpose of this study was to investigate the Effects of Student Self-assessment on Chemistry learning outcome and Attitude to Examination Malpractice in Ogun State, Nigeria.

The specific objectives are to:

1. ascertain if there is any difference in students' learning outcome due to experimental conditions.
2. determine if there is any difference in students' learning outcome as a result of the interaction effect of gender and experimental conditions.
3. examine whether there is any difference in the post self-assessment scores of students who received training and those who did not.
4. ascertain if there is any difference in students' attitude to examination malpractice due to experimental conditions.

5. examine the interaction effect of gender and experimental conditions on student's attitude to examination malpractice.

1.6 Research Questions

The following research questions guided this study.

1. To what extent is Chemistry learning outcome scores different between participants in the self-assessment training group and the control group?
2. What is the interaction effect of gender and experimental conditions on participants' learning outcome in Chemistry?
3. What is the difference in the post test self-assessment scores between participants in the experimental and control groups?
4. To what extent are Chemistry students' attitudes to examination malpractice different between participants in the self-assessment training group and the control group?
5. What is the interaction effect of gender and experimental conditions on Chemistry participants' attitude to examination malpractice?

1.7 Research Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in the Chemistry learning outcome post-test scores of participants who were exposed to self-assessment training and those who were not.

2. Post-test Chemistry learning outcome scores is not significantly different between male and female participants in the training and control group.
3. There is no significant difference in the participant's post-test self-assessment scores between the experimental and the control groups.
4. There is no significant difference in participants' attitude to examination malpractice between the self-assessment training and the control groups.
5. Gender and experimental conditions have no significant interaction effect on participants' attitude to examination malpractice.

1.8 Significance of the Study

This study is significant because it can bridge the gap in the search for a sustainable steady good performance by Chemistry students and a panacea for examination malpractice since the acquisition of self-assessment skills will help to minimize students' tendency to engage in examination malpractice. This is because the students by virtue of the acquired self-assessment skills are equipped to monitor their strengths and weaknesses against set standards. So the knowledge of his limitations makes the student to direct his efforts to what needs to be learned and improve performance. The students become self-confident, independent and active learners; who have developed life-long learning skills and as such have no reason to indulge in examination malpractice.

The results of the study would help the teacher to confirm the efficacy of student self-assessment training package as an effective assessment instrument or tool. The study is also significant because self-assessment as a learning strategy empowers the student to monitor his strengths, weaknesses and set achievable goals to improve learning.

The findings of this research provided empirical data on whether male and female participants exposed to student self-assessment training in the Nigerian context differed in their attitude to examination malpractice. The results of this study is of benefit to the Chemistry teacher because it would help them to do proper diagnosis and get a proper understanding of learning difficulties that may inhibit students' learning in Chemistry. The outcome of this research would also serve as a source of information to the Ministry of Education and school administrators on student self-assessment, as a teaching-learning strategy which is activity based; which will enhance academic achievement and curb examination malpractice in Nigeria.

1.9 Scope and Delimitation of the Study

This study was limited to selected co-educational public senior secondary schools in Ogun State of Nigeria. Co-educational public schools were used because they had a good representation the male and female gender. The senior secondary two students in selected schools participated in the study. The study focused on application of student self-assessment to the study of Chemistry and curbing Examination Malpractice. Organic Chemistry topics

were the focus of this work because the researcher was restricted to teaching these topics as prescribed in the Third Term 2014/2015 syllabus by Ogun State Ministry of Education.

1.10 Operational Definition of Terms

The following terms were defined within the context of the study:

Self-assessment: in this study means that students make judgement about their own achievement and their learning processes. Students decide on actions they need to take to make further progress in learning. Student self-assessment was measured in terms of the self-assessment skills and knowledge acquired by the students.

Self-assessment skills: refer to the ability acquired by the students to assess their own strengths and weaknesses against set criteria or standards. This ability or skill was acquired by undergoing the self-assessment training under the tutelage of a teacher. Student self-assessment skill was measured using the Student Self-assessment scale in Chemistry. The scores obtained determined how well students have utilized the skills in the improvement of Chemistry achievement.

Student self-assessment instructional guide: This is also known as a **rubric**, a **scoring tool**, **guideline** or **criteria** for assessing a piece of work. It is a set of instructions that show weightings for different levels of performance. The instructional guide contains a set of

general criteria and scale of possible points to be assigned in the scoring of a student's work in a given outcome area. The researcher involved the students in the construction of this tool and also trained them to apply it in grading their Chemistry tasks.

Examination malpractice: refers to anything an examinee does that contravenes the rules and regulations guiding the conduct of the examination. This is a wrong way of succeeding in an examination. The Attitude to Examination Malpractice questionnaire was used to measure this variable. A high score implied a greater disposition to engage in malpractices and vice versa.

Learning outcome: in this study it is measurable and observable knowledge, skills and attitudes acquired through participation in the Chemistry student self-assessment training. This was measured using a Chemistry achievement test. The scores obtained were indicative of whether students' self-assessment training had improved Chemistry learning in the students.

Attitude to Examination Malpractice: refers to an examinee's disposition towards cheating during Chemistry examinations which could be positive or negative. This could give an indication of the level of a student's preparedness for examinations. It was measured using the Attitude to Examination Malpractice Scale.

1.11 List of Acronyms and Abbreviations

AEMS: Attitude to Examination Malpractice Scale.

ANCOVA: Analysis of Covariance.

CAI: Centre for Academic Integrity.

CAT: Chemistry Achievement Test.

ECOWAS: Economic Community of West African States.

EFCC: Economic and Financial Crimes Commission.

ICPC: Independent Corrupt Practices and related offences Commission.

KWL: “Know”, “Want”, “Learn”.

LSD: Least Significance Difference.

MDGs: Millennium Development Goals.

NECO: National Examinations Council.

SS II: Senior Secondary Two.

SSCE: Senior School Certificate Examination.

STEM: Science Technology Engineering and Mathematics.

UNESCO: United Nations Educational Scientific and Cultural Organisation.

WAEC: West African Examinations Council.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Literature was reviewed under the following subheadings:

- 2.1 The Subject Matter of Chemistry and its Contributions to Scientific and Technological Development.
- 2.2 The Concept of Student self-assessment and Benefits to Students.
- 2.3 Analysis of Self-assessment as it Promotes Understanding.
- 2.4 The Self-assessment Model.
- 2.5 Procedures for Conducting Student Self-assessment.
- 2.6 Distinctions between Self-assessment and Self-evaluation
- 2.7 Student Self-assessment and Learning Outcome.
- 2.8 Historical Occurrence of Examination Malpractice in Nigeria.
- 2.9 Examination malpractice in other parts of the world.
- 2.10 Disciplinary action for Academic Dishonesty and Students' Gender: Sweden.
- 2.11 Correlates of Academic Dishonesty in Australia.
- 2.12 Government measures for controlling examination malpractices
- 2.13 Causes of Examination Malpractice.
- 2.14 Attitude to Examination Malpractice and Gender.
- 2.15 Examination Malpractice and Student Self-assessment
- 2.16 Consequences of Examination Malpractice.
- 2.17 Managing Examination Malpractice
- 2.18 The way out of Examination malpractice

- 2.19 Attitude and Examination Malpractice.
- 2.20 Gender Disparity in Chemistry Learning Outcome.
- 2.21 Appraisal of Literature Review and Gaps in knowledge

2.1 The Subject Matter of Chemistry and its Contributions to Scientific and Technological Development

Chemistry is the study of the composition, properties, uses and changes matter undergoes (Osei, 2010). It deals with the study of elements and the changes they undergo under different conditions. Chemistry has contributed immensely to meeting our basic needs and improving the quality of human life. Most of the things we use every day such as: soaps and detergents for cleaning; hair creams and perfumes for grooming; oil and margarine; plastics for a wide variety of uses, are all products of chemical processes. Insecticides and fertilizers have immensely improved food production. Chemistry is one of the major science subjects taught at the secondary school level in Nigeria. It must be passed at credit level without which candidates cannot proceed to study science and technology disciplines at the tertiary level. One of the aims of secondary education as emphasized in the National Policy on Education (FGN, 2013) is to prepare the citizens to be useful to themselves, their immediate society and also for higher education. According to Onu (2007), development means to bring something to a more advanced or more highly organized state. Attainment of a developed status involves application of modern science and technology. Therefore, scientific manpower development becomes imperative if a nation is to advance in science and

technology. The nature of Chemistry places it at the centre of all other sciences and so modern technology depends heavily on the sciences for its continuous growth (Jebson&Modibbo, 2009). Nigeria's burning desire for scientific and technological development will be impeded if students' poor learning and subsequent achievement in Senior Secondary School Examination (SSCE) persists.

2.2 The Concept of Student Self-assessment and Benefits to Students

Self-assessment are quizzes students take to assess their academic weaknesses and strengths (Thea, 2008). She opined that student self-assessment could be academic-oriented, career-oriented or personality-oriented. Student self- assessment is not only beneficial to the student but to the teacher as well. According to Tonarely (2008), teachers use self-assessment to ascertain if students are learning what they need to learn. Students will enjoy telling the teacher what worked and what did not work. In an open classroom where students' opinions are valued, a positive relationship will exist between students and teachers.

Tonarely (2008) asserted that during self-assessment students' differences are recognized. When students engage in self-assessment, they get to know what works for them; since students learn in different ways. It helps students to know whether the activities the teacher asked them to carry out helped their learning experiences. When students are made to assess their own learning, teachers get information on what worked and what did not. One way of assessing students' learning is to ask the students to make a "KWL" ("know" "want" "learn")

chart which consists of three boxes. In the first box students write what they already “know” about the topic; in the second box the students write what they “want” to know and in the third box they write what they have “learnt”. The teacher can re-evaluate his technique if he notices that the students missed certain points in the lesson taught. For instance, if he had used lecture method, he may want to utilize group work approach in subsequent lessons to help students learn better (Tonarely, 2008). Student self- assessment improves learning when students are made to analyse what they have learned. Before going to a new topic, they are forced to carry out a mental review and ascertain whether it was beneficial. The teacher can enhance learning by asking the students to state what would have improved their learning (Tonarely, 2008).

2.3 Analysis of Self-assessment as it Promotes Understanding.

McDonald (2007) reported that studies on self-assessment and academic achievement have provided undisputed evidence that high school students trained in self-assessment skills outperformed their untrained counterparts in external examinations in all curriculum areas. Understanding is a key element for achievement as self-assessment improves students’ understanding of concepts. She was of the opinion that young people claimed that they were never understood and for this reason we needed a different type of assessment like self-assessment which gives the learner a sense of belonging, achievement, autonomy, independence, empowerment and mastery of their own destinies while affording the learner a

clear understanding of what is being learned. It was further suggested that self-assessment should be introduced early to teachers in their teaching career so that it would become a common practice in the classroom.

According to McDonald (2007), assessment was often traditionally conceptualized as coming from a distant source like a supervisor, examiner, lecturer, teacher, tutor, mentor or coach. But not much emphasis was placed on assessment that originates from an internal close source like the person himself or herself doing his or her own assessment. Since the student is the one constantly doing his course- textbooks, homework and teacher personality, he or she has the advantage of determining the effectiveness of aspects of the course of study through self-assessment. The learner can focus on himself or herself being mindful of her peculiarities.

Two key elements are absolutely necessary for self-assessment: the development of knowledge and an appreciation of suitable standards and criteria for meeting those standards; and ability to make judgements about whether or not the work involved does or does not meet those standards which has to do with critical thinking (McDonald, 2013). A student's desire for achievement and a clear understanding of what is involved makes the learner deeply engrossed in the process.

McDonald (2007) observed that self-assessment not only encompasses testing and grading one's own skills or work but entails the active participation of the individual in evaluating

what is good, mediocre or poor work in any situation. It strengthens personal accountability for academic achievement. Self-assessment offers a method for judging the effectiveness of a criterion; shows a timetable for ultimate progress of the individual and establishes a sequence for failure. Also, self-assessment establishes a procedure that links criteria over time, across subjects with an external assessment. Furthermore, self-assessment emphasizes focusing assessment at important learning targets, using assessment to plan instruction and communicating assessment results in a way that has positive effect on the learner.

Considering self-assessment as an aid to instruction or as an instructional tool and not as an assessment tool, high school teachers do not use assessment done by students as part of their reports. Students may use it as part of their formative evaluation. In her analysis, McDonald (2007) viewed self-assessment as the act of evaluating or monitoring one's own level of knowledge, performance and understanding in a metacognitive framework. Self-assessment enables the individual to make an informed assessment of his or her own work, with an appreciation for the understanding of the concepts and qualities upheld and practised by the adjudicator of his or her work. Self-assessment skills acquisition may not be naturally endowed on a teacher or student but may require formal training as in other skills.

In a study reported by McDonald (2007), students accepted the self-assessment tasks as teaching and learning strategies in their own right. It was also found that the students'

awareness and use of skills in their class activities were greatly enhanced and that the teacher's role changed from a dominating instructor to a delegator as the students became more proficient at self-assessment. Self-assessment affects a person's understanding as it emphasizes high levels of thinking-metacognitive, self-reflective, self-regulated- as well as goal-directed learning and preferred learning styles. Since students discuss standards and criteria for making judgements, they are involved in talk-based activities that force them to reason with one another.

Self-assessment entails reflecting on past achievements, critically evaluating present performance and planning future goals. It fosters understanding as the individual moves from past, present to future situations. According to MacDonald, it is premised on realistic knowledge of the whole self in relation to educational goals. It asks "*How am I doing?*" "*How can I do better?*" The students learn to contrast and compare their work with models and against a set of criteria. Hence, it is imperative that students understand what they are attempting before starting the task. So the learner should understand the standard of performance, know what to achieve and be able to compare his performance to that of the standard.

Black and William (1998) who were the proponents of formative assessment declared that the student must take an active, responsible part in the assessment for sustained meaningful

learning to occur. They recommended that the student has to close the gap between his or her state of knowledge as revealed by the feedback from the teacher and the desired state of knowledge. A student who does not understand the purpose of teacher's comment may be unable to internalise the work and improve in the future. It was posited that teachers should share the responsibility of assessment with the students whose self-assessment would contribute to their overall assessment.

In his study on effect of instructional rubrics and guided self-assessment on students' writing and understanding of good writing, Goodrich (1997) revealed that the rubric-referenced self-assessment had a positive effect on female students' writing but no effect on male writing. Mercer, Dawes, Wegerif and Sama (2004) in their study declared that spoken language can be related to the learning of science in the context of teacher-led interactions like self-assessment. This is in consonance with the sociocultural account of cognitive development which emphasises the guiding role of a more knowledgeable member of the community in the development of the learner's knowledge and understanding. It is for this reason that self-assessment is a collaborative, interactive process that involves all of the self and others in relation to standards and or criteria. Interaction with peers is also beneficial to students' learning and understanding. Mercer *et al.* (2004) further asserted that constant positive reinforcement from teachers and others involved in self-assessment training made students to realize that self-assessment is not subject-specific or task-specific but targeted at the whole

individual. The skills that students learned enabled them to communicate with better understanding. Students developed great focus, in-depth understanding and information which clearly reflected in the performance of the experimental group students as they outperformed their untrained counterparts in all curriculum areas of business studies, humanities, technical studies and science. According to Mercer *et al.* (2004), the students also learned that making self-assessment a habit supported Aristotle's popular assertion that we are what we repeatedly do and that excellence is a habit.

2.4The Self-assessment Model

Ross (2006) suggests that self-assessment contributes to higher student achievement and improved behaviour. Figure 4 which was based on Bandura, (1997) Social Cognitive Theory shows a model explanation of how self-assessment contributes to learning. Self-assessment is made up of three processes that self-regulating students employ to observe and interpret their behaviour. The three processes are: self-observation, self-judgement and self-reaction. Students make self-observation when they focus on an aspect of their performance related to their subjective standards of success. Then, self-judgement occurs when students determine how well their general and specific goals were met. Student self-reactions and interpretations of the extent of goal achievement show how satisfied students are with the result of their actions. Self-assessment training focuses students' attention on specific aspects of their performance using dimensions of the jointly constructed rubric by redefining the standard

students use to determine their success (using levels of the rubric) and by the teacher giving feedback to reinforce positive reactions to successful performance. The effects of self-assessment training makes students interpret their performance as a mastery experience. The mastery experience is a powerful source of self-efficacy. Self-assessment contributes to self-efficacy beliefs, that is, a perception of students' ability to perform actions required by similar tasks in the future (Ross, 2006). Students, who show great confidence to accomplish a particular task, more likely visualise success than failure. The students set higher standard of performance for themselves in future tasks. This gingers their effort to persist. Hence, higher goals and increased efforts combine to give higher achievement.

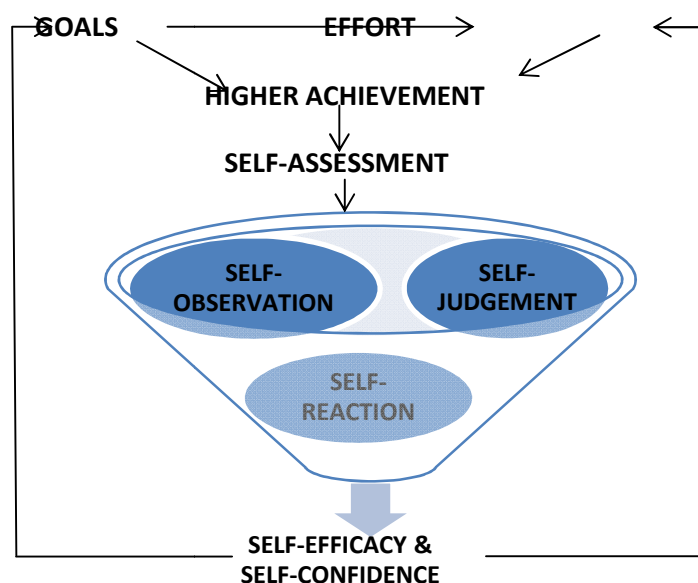


Figure 4: A model of how self-assessment contributes to learning outcome (Ross, 2006).

2.5 Procedures for Conducting Student Self-assessment

Alpert (2002) was of the opinion that promoting confidence and student's self-awareness through self-assessment helped them to make good grades. He stressed that asking daily questions was imperative. The teacher should check students' understanding informally by asking open ended questions about their performance at the end of the class. Each student should respond to the question on a piece of paper. Rubrics are very important in the self-assessment process. Rubrics are evaluation guides that provide feedback on several different learning objectives, recognizing where a student falls into the spectrum of proficiency for each objective. Teachers should model the use of rubrics early in the class and explain to the students the importance of the holistic grading. When the students get used to the concept, they can use the rubrics to evaluate their own progress. Through the use of rubrics the teacher can receive information that reveals gaps between students' perceived performance and actual performance (Alpert, 2002).

The teacher should schedule regular discussions with individual students to informally interview them on their progress. This makes the students develop the ability to be introspective and reflect on their progress. Asking open-ended and probing questions pushes the students to think about their own thought processes, learning habits and preferred learning styles. Asking students to write down the dialogue will help them remember what to do (Alpert, 2002). Alpert (2002) opined that the next step in student self-assessment is to

encourage students to be responsible for their own learning. This will require of the students to set realistic goals for improving their learning. These goals should be documented by the teacher and he should regularly remind the students about these goals and challenge them to assess themselves against the goals.

Orsmond (2004) asserted that students should be involved in developing and implementing the marking criteria (rubrics) for student self-assessment. Students should have a good understanding of the assessment marking criteria. The design of these marking criteria involves the discussion of learning outcomes. The implementation of self-assessment involves a lot of effort, reflection and planning on behalf of the tutor. Students should be made to perceive self-assessment as a natural process in their learning. They should be actively involved in its implementation and its importance in lifelong learning. Generally, students judge their own work against a given criteria, provide information on how they can improve on that work in future and then grade their work. When the word “formative” is used in conjunction with assessment or evaluation, it connotes an improvement process while the word “summative” is used to describe a decision making process.

2.6 Distinctions between Self-assessment and Self-evaluation

Assessment and Evaluation are necessary and complementary in education. Educators use assessment and evaluation to help their students build lifelong learning skills. Borden and Zak Owens (2001) declared that assessment provides feedback on knowledge, skills,

attitudes and work products for the purpose of elevating future performances and learning outcomes. The Ontario Ministry of Education (2006) defined assessment as the process of gathering information from a variety of sources that accurately reflects how well a student is achieving the curriculum expectations in a subject area, while evaluation is an informed professional judgement about the quality of a child's work at a given point in time using established criteria. Evaluation determines the level of quality of an outcome or performance and allows for decision making based on the level of quality of performance attained. Dindyal (2005) described assessment as gathering information to inform the teaching practice on how to help students learn more. It involves considerable feedback during learning while evaluation decides whether or not students have learned what they needed to learn by considering evidence and determining how well they have learned.

Stallings and Tascione (1996) asserted that student self-assessment can be used to build students' confidence in their ability to do Mathematics. Student self-assessment makes the learner to become independent in their learning of Mathematics. Student self-assessment was defined as the process in which a student determines the type of errors made in his or her Mathematics work, while student self-evaluation is the students' reflection about his or her general understanding of the Mathematics explored up to that point. Student self-assessment gives a local view of a student's learning while student self-evaluation provides a global view. The Ontario Ministry of Education described student self-assessment as a process by

which students gather information about and reflects on his or her learning. It is the student's way of assessing personal progress in knowledge, skills processes and attitudes

There are three categories of assessment namely: diagnostic (assessment for learning), formative (assessment for learning) and summative (assessment of learning) (Dindayal, 2005). The purpose of diagnostic assessment is to give teachers specific information about when and how to proceed with instruction and establish the baseline from which to observe growth. Formative assessment encourages self-directed learning by giving feedback. It assists with programming decisions. It is assessment for learning. Summative assessment provides information that could be used to evaluate student achievement and determine the overall grade or level of a student's performance. It provides feedback for reflection to judge the effectiveness of a unit of study.

2.7 Student Self-assessment and Learning Outcome

The main purpose of student self-assessment is to improve learning. Sadler and Good (2006), in a study investigated the impact of Self- and Peer- Grading on Student Learning and compared grades assigned by the teacher to those awarded either by students to themselves or by their peers. After training some science students to grade with the help of a scoring rubric; they discovered a very high correlation between student self-assigned grades and those assigned by their teachers. Students who corrected their own test using the scoring rubric

showed tremendous improvement in learning. They concluded that self-grading and peer-grading both saved the teacher's time, but most importantly, that self-grading resulted in increased student learning than peer-grading does (Sadler & Good, 2006). Also, the role of the nurse educator in student's self-assessment was explored by Miller, 2012. He discovered that student self-assessment was an important aspect of formative assessment. Self-assessment increased the students' ability to self-regulate and engage in their learning. He identified self-assessment as an important component of life-long learning among nursing students. Self-assessment was utilized as a teaching strategy to transform nursing education because it provided the students with opportunities to learn in an environment where ample performance feedback was provided (Miller, 2012).

Ross (2006) opined that a valid assessment is one that contributes to student learning—if an assessment has a negative effect on the student learning, the test is considered invalid. According to Ross (2006), inclusion of test consequences as a dimension of test validity is a key element of student self-assessment. Research evidence indicates that self-assessment contributes to higher student achievement and improved behaviour (Ross, Hogaboam-Gray&Rolheiser, 2002). Students were systematically trained on the four elements that make up self-assessment – involving students in defining assessment criteria; teaching students how to apply the criteria; giving students feedback on their self-assessment and helping students use assessment data to develop action plan. Students in the experimental group that

passed through this process over 8-12 weeks duration outperformed control group samples in grades 4-6 Narrative writing; grades 5-6 Mathematics problem solving (Ross *et al*, 2002b) and grade 11 Geography, (Ross & Starling, 2005).

Positive results were also obtained with less extensive self-assessment training programmes. Boulay (2003) discovered that teaching grade 7-8 students how to use a rubric to assess themselves improved their writing performance, even though the effects were limited to female students for one of two writing genres. Similarly, McDonald and Boud (2005) found positive achievement effects for self-assessment across different subject areas. Self-assessment also produced positive results for non-academic exercises. When grade 7 students in cooperative learning groups were provided with transcripts of their conversations, the students used a coding scheme to assess the frequency of help giving and help seeking in their groups. Self-assessment contributed to increased positive interactions and a decline in off-task behaviour (Ross, 1995).

2.8 Historical Occurrence of Examination Malpractice in Nigeria

Anzene (2014) asserted that the first case of examination malpractice was first recorded in the year 1914, during Cambridge School Certificate Examination. The examination paper was reported to have leaked before the date that the examination had been scheduled. This was many years before the establishment of WAEC. As the years went by, examination malpractice became even more pronounced in the 1970s, involving persons other than the

candidates. Ever since, examination malpractice became more sophisticated and advanced. There was an outcry in 1977 because it marked a watershed in the history of examination malpractice. There was a public outcry in Nigeria about the credibility of examinations conducted by the West African Examinations Council, as it was the only organization responsible for conducting public examinations in the country. Consequently, Justice Sogbetun was appointed to head a Judicial Commission of Enquiry to look into the affairs of WAEC in relation to problems of efficient conduct of examinations and prompt release of examination results. The Judicial Commission of enquiry reported excess work load on WAEC and recommended the establishment of other examination bodies to take over the conduct of some of its examinations.

The former Minister of Education, Professor RuquaayatRufai also reported an increase in the cases of examination malpractices in WAEC SSCE from 2005-2009. She reported that the National Examinations Council (NECO), recorded examination malpractices cases of over 263 000 in its 2009 November/December examinations while one million cases were reported in SSCE 2009 June/July examinations. The Federal Ministry of Education (FME), in 2006, derecognized and blacklisted 324 secondary schools across Nigeria as centres for conducting public examinations from 2007 to 2010.

Table 2: Examination Malpractice Cases in WAEC SSCE (2005-2015)

| YEAR | TOTAL CANDIDATES WHO SAT MAY/JUNE SSCE | CANDIDATES INVOLVED | PERCENTAGE % |
|-------------|---|--------------------------------|-------------------------|
| 2005 | 1064869 | 73 050 | 6.86 |
| 2006 | 1153561 | 82 941 | 7.19 |
| 2007 | 1251826 | 74 734 | 5.97 |
| 2008 | 1274467 | 100 428 | 7.88 |
| 2009 | 1357071 | 118 608 | 8.74 |
| 2010 | 1351557 | 77168 | 5.70 |
| 2011 | 1540250 | 81573 | 5.29 |
| 2012 | 1672224 | 112000 | 6.70 |
| 2013 | 1543683 | 112865 | 7.31 |
| 2014 | 1692435 | 145795 | 8.61 |
| 2015 | 1593442 | 118101 | 7.41 |

Source: WAEC Annual Report 2005 to 2015.

Table 3: Examination Malpractice in Nigerian Secondary schools by geopolitical zones (2007-2010)

| Geo-political zone | Schools involved | Percentage % |
|---------------------------|-------------------------|---------------------|
| North-Central | 54 | 16.60 |
| North-East | 08 | 2.50 |
| North-West | 12 | 3.60 |
| South-East | 48 | 14.80 |
| South-South | 116 | 36.00 |
| South-West | 86 | 26.50 |
| Total | 324 | 100 |

Source: WAEC Annual Report 2007 to 2010.

Tables 2 and 3 show that Examination malpractice cases have increased over the years. A cursory look at table 3 reveals that the South-South geopolitical zone recorded the highest number of (116) schools involved in examination malpractice cases, closely followed by the South-West (86) which happens to be where Ogun State, the focus of this study falls into. Nigeria made a negative history in 2012, when she was ranked as number one in the world examination malpractice index (Onyechere, 2008). In 2013, WAEC derecognized 118 principals and 113 schools and barred 3321 candidates from writing its examinations for two years. It is interesting to note that out of 113 schools that were derecognized as “magic centres” 64 or 54% were state government schools while 54 or 46% were private owned schools. Among the 54 private institutions were faith based organizations.

2.9 Examination Malpractice in other parts of the World

The term examination malpractice is not peculiar to Nigeria alone. It is a common practice in other parts of the world. Various terms which are synonymous with examination malpractice have been used to describe cheating that occurs in a formal academic setting. Academic misconduct and academic dishonesty are synonymous with examination malpractice. Generally, this may include: impersonation, plagiarism, deception, bribery, cheating, sabotage, professional misconduct and falsification of data. Over the years, academic misconduct has been recorded to have occurred in all types of educational setting ranging from primary, secondary to tertiary institutions.

Thousands of years ago, academic dishonesty dates back to the first tests during the Chinese civil service examinations even when cheating carried death penalty (Bushway& Nash, 1977). At the end of the 19th century, before the founding of Modern Language Association (MLA) and the American Psychological Association (APA) there were no set rules on how to properly cite writings from other people so plagiarism was committed out of ignorance (Simmons, 1999). According to Simmons (1999) cheating was widespread at college campuses in the United States in the late 19th and early 20th centuries.

Previous studies in the United States revealed that 20% of students started cheating in their first grade (Bushway& Nash, 1977). Other studies show that 56% of Middle school and 70% of High school students have cheated. In Germany, a large scale study revealed that 75% of

university students admitted to have committed one of the seven types of academic misconduct.

In an academic setting, students are not the only ones that cheat. A research finding among North Carolina school teachers revealed that 35% confessed to have seen their colleagues engaging in one form of cheating or the other. Some teachers also inflated the results of their students (Jacob & Levitt, 2003).

Research studies on academic dishonesty in the United States of America in the 1960s revealed that nationally 50% to 70% of college students had cheated at least once (Bowers, 1964). The rate of cheating in the United States differed depending on the type of school, size or anti-cheating policies of the school in question. For example, the number of students who engage in academic dishonesty in small elite colleges can be as low as 15% to 20%; while cheating at large public universities was as high as 75% (LaBeff, 1990). A recent research on graduate education discovered that 56% of Masters in Business Administration (MBA) students admitted to cheating, while 54% of graduate students in engineering, 48% in education and 45% in law also cheated (Pope, 2007).

A comparative study of academic misconduct among business students in the United States and United Arab Emirate revealed that 71% of all the respondents admitted to academic misconduct in a recent one-year period (Williams, Tanner, Beard & Chacko, 2014). Furthermore, Business students from the United Arab Emirates were significantly less likely

to perceive various academic misconduct behaviours as forms of serious cheating compared to Business undergraduate students from the United States of America.

Khalid (2015) did a comparison of Academic Misconduct across disciplines, using faculty and student perspectives in the United States. Majority of undergraduate students across various disciplines in America had engaged in some form of academic misconduct during their education in college. A high prevalence of cheating was identified among engineering students, engineering education students and graduate business students. Outside of the United States, Khalid (2015) reported that a study carried out in New Zealand showed that 90% of the students surveyed admitted to cheating. In a study in Taiwan, a misconduct prevalence rate of 61.7% was recorded while in a Singapore study, almost all the students surveyed admitted to some form of cheating at least once. College students surveyed in Canada, United Kingdom and Australia, with 53%, 60% and 81% respectively admitted to have been involved in some form of academic misconduct.

According to McCabe and Trevinno (1997) research has revealed that a number of demographic characteristics that influence cheating include: age, gender and grade point average. Female students, older students and students with high academic achievement are less likely to cheat (McCabe & Trevinno, 1997). Students involved in many extra-curricular activities are more likely to cheat because they may be less committed to their studies since various activities are demanding for their time and interfere with their studies. It was found that younger students are more likely to be involved in academic misconduct, especially

during the second year in college (Smith, Davy & Easterling, 2004). One might expect students with a high level of morality to exhibit a lesser likelihood to cheating; but research has shown that there was no relationship between students' performance in a morality test and likelihood of cheating (West, Ravenscroft & Shrader, 2004). It was also found that higher academic procrastination among students led to an increase in seven forms of academic misconduct (Patrzek, Sattler, van Veen, Grunschel, Fries, 2014). Also, nationality, race, class and religion were found to show little correlation with academic misconduct. The Jews tend to cheat less likely than people of other religions. In the United States, English as a second language students were more likely to engage in academic misconduct than native English speakers because they feared paraphrasing in their own words in order not to lose the meaning of the sentence. In British universities, the student population (12%) consists of students from outside of the European Union but they comprised 35% of academic dishonesty cases.

2.10 Disciplinary action for Academic Dishonesty and Students' Gender: Sweden.

The opposite of Academic dishonesty or academic misconduct is Academic integrity. Academic integrity refers to honesty and responsibility in scholarship. Students as well as Professors have to obey the rules of honest scholarship. There are various forms of dishonesty. The major ones that come to mind are plagiarism, cheating, lying, fabrication, deception, bribery, Professorial misconduct, sabotage, impersonation, aiding and abetting

collusion. These unethical actions may attract different degrees of sanctions or punishment from the school authorities.

According to Witmer and Johansson (2015) Academic dishonesty in Swedish higher education which includes cheating and plagiarism is on the increase and a growing problem. Cheating, plagiarism and other forms of academic dishonesty are of great concern because they threaten the integrity of the learning process and reduce the credibility of educational programmes. The complexity of this issue is compounded by the fact that individuals have easy and unrestricted access to the electronic media. In 2009, the Impact of Policies for Plagiarism in Higher Education across Europe (IPPHEAE) was developed to ascertain how student plagiarism problem was being addressed in higher education institutions in the twenty-seven countries – of which Sweden is a member, that make up the European Union (EU). According to the academic maturity model that measured areas like training, research and policies for academic misconduct, Sweden ranked three (3) out of the twenty-seven countries. This ranking was as a result of the fact that a national system for collecting data annually from universities and national policies for dealing with such problems were in existence.

The Swedish National Agency for Higher Education data from 2001 to 2009 reported that there was a significant increase in the number of board sentences (Witmer and Johansson, 2015). The academic misconduct included unauthorized collaboration, plagiarism, cheat sheets, document forgery, disruptive behaviour and ethnic or sexual harassment. Plagiarism

and fabrication were the most frequently reported while ethnic or sexual harassment was the least. It is noteworthy that despite the fact that governance and reporting structures in Sweden can track and report academic misconduct, the disciplinary actions are subjective and dependent on the opinion and judgement of faculty members of the academic institution in question.

The severity of penalty and the role of faculty have significant impact on cheating behaviour.

Oftentimes, the student gets punished while the faculty is rewarded for reporting academic dishonesty. In a study by McCabe (2005) of ten thousand (10 000) faculty members from 2002 to 2004 revealed that 44% of faculty members who were aware that their students cheated during this period never reported these students to the appropriate university authority. Also the faculty members' perception of plagiarism and severity of the offense affected the punishment that was meted out on the offenders.

Witmer and Johansson (2015) reported a lack of consensus on the issue of gender and academic dishonesty. Leming (1980) revealed that both male and female cheated under low risk conditions. It was also observed that threats of sanction had a higher impact on women than on men. This showed that there was a significant discrepancy in the frequencies of cheating between male and female subjects under low risk conditions. Contrary to this, Nonis and Swift (2001) observed that academic dishonesty was not situation specific but linked to a person's attitude. In their study of a large number of both graduate and

undergraduate students, it was found that academic and workplace related dishonesty strongly correlated. Cheating and plagiarism were not situation specific but connected with personal attitudes. Nonis and Swift were of the opinion that once an individual formed a behaviour that was acceptable, the person goes ahead to exhibit this behaviour not only in educational settings but in other places like the workplace. They also discovered that male and younger students were more tolerant of dishonest behaviour in the workplace.

The observation that the female gender were less tolerant to academic dishonesty is further supported by the investigation of Ameen, Guffey and McMillan (1996) where Accounting students responded to survey questions about unethical behaviour that they were expected to be conversant with, either by having observed such incidences or by having partaken in them. In this investigation it was found that female students were less tolerant to unethical behaviour, were less cynical, and were less likely to engage in acts of academic dishonesty than male students. Other studies support this opinion that students with moral beliefs were less likely to be involved in academic dishonesty, for instance, Gibson, Khey and Schreck (2008). This could also be ascribed to the student's personal interpretation of the extent of severity of the dishonest act and if, it is based on their attitudes and logic, the behaviour could even be seen as academic dishonesty (Colnerud & Rosander, 2009).

On the issue of gender bias and disciplinary action, Witmer and Johansson (2015) ascertained whether male and female judges imposed similar sentences on criminal offenders and

whether they used the same criteria when arriving at a decision. The findings showed many similarities but few differences between male and female sentencing practices. The female judges tended to impose harsher penalties like incarceration to longer sentences. In a similar study female faculty members were 36% more likely to judge plagiarism cases more severely than their male counterparts. The gender bias this infers was trivial when compared to the frequency and use of the plagiarism material. However, these studies did not distinguish between the severity of the judgement for male and female offenders.

In their study to ascertain if gender differences existed with respect to conviction of students for academic dishonesty; Witmer and Johansson (2015) analysed data obtained from the Swedish National Agency for Higher Education (SNAHE) from year 2010. The number of full-time students that were subject to disciplinary action had increased from 2001 to 2013. Plagiarism was the most common reason for disciplinary action and 0.23% (a small fraction when compared to 60 to 70% of students who admitted to cheating in a self-report) of full-time University students were subject to disciplinary action. The fraction of students that were convicted for academic misconduct increased from 0.04% in 2001 to 0.25% in 2013.

Witmer and Johansson (2015) concluded that based on statistics from 2010 and self-reports on academic dishonesty behaviour, female students were less prevalent in disciplinary matters (warnings and suspensions). They found no systematic gender bias in the severity of

penalties. In some Swedish Universities, the female students had a higher ratio in gender bias while in other universities; male students had a higher ratio. This further confirmed the lack of gender bias and could be attributed to environmental conditions and mitigating circumstances that Swedish disciplinary boards are obliged to take cognisance of when deciding disciplinary actions. The observed lack of trend in gender bias and the penalty severity for academic dishonesty is particularly interesting because it has been observed that females tend to receive penalties that are less for crimes than their male counterparts do, when the same crime is compared (Ahola, Christianson & Hellstrom, 2009).

2.11 Correlates of Academic Dishonesty in Australia.

Hrabak, Vujaklija, Vodopivec, Hren, Marusic and Marusic (2004) confirmed that misconduct is a prevalent and growing problem in colleges and universities around the world. There are many individual characteristic and contextual factors that underpin the prevalence of academic dishonesty. Hence, Eriksson and McGee (2015) examined the correlates of academic dishonesty among criminal justice and policing students in Australia because those students who get convicted for academic dishonesty may experience difficulty with employment within the criminal justice, legal or policing agencies. Even though Transparency International (2014) had ranked Australia among the top twenty (20) “cleanest” countries in the world, in perceived levels of public sector corruption, the history of corruption in Australia warranted the need to conduct a study into academically dishonest behaviour within the cohort of future policing and criminal justice professionals.

The effects of academic dishonesty at both institutional and individual levels are rather grave. Student engagement in academic dishonesty at the institutional level has the ability to reduce the integrity and reputation of the university and also threaten the economic viability of universities within competitive educational markets. Academic dishonesty can hinder the ability of the university to ensure that students who pass through the institution have the knowledge and skills they require for further studies and for employment. One of the negative effects of cheating at the individual level includes putting non-cheating students at a potential academic disadvantage to those who engaged in academic dishonesty. Academic dishonesty has been associated with unethical workplace behaviour and is likely to continue after graduation. The potential continuation of unethical workplace behaviour is likely to apply to future police and criminal justice professionals bearing in mind that they are bound to exercise discretionary power when dealing with their clients.

Academic dishonesty as reported by Hrabak *et al.* (2004) constitutes four main types of fraudulent and unethical behaviours. Firstly, academic dishonesty means cheating and includes intentional and attempted use of unauthorised material or information in an examination. Secondly, is the fabrication or invention of any information or citation. The third definition is facilitation, which has to do with behaviours which assist other students to engage in cheating. The last form of academic dishonesty is plagiarism which refers to deliberate use, reproduction or adoption of ideas, statements and words of another person as one's own without acknowledgement of the author.

Other definitions that fall within the umbrella of academic dishonesty include misrepresentation, which includes giving false excuse to get an assignment extended or an examination deferred. Definitions of academic dishonesty may include academic sabotage which entails destroying books in the library so that other students may not use them.

Researchers have suggested that individual characteristics of students who are likely to engage in academic dishonesty include being a male and from a non-English speaking background(Marshall & Garry, 2006). Some studies have found that the male gender is a statistically significant predictor of higher likelihood of involvement in academically dishonest behaviour. A meta-analysis conducted by Whitley, Nelson and Jones(1999) examining gender differences in attitudes toward and engagement in academic dishonesty revealed that women displayed significantly higher negative attitudes towards academic dishonesty than the men. Results further showed that men were more likely to engage in academic dishonesty, although the gender differences were attributed to a relatively small effect size. However, other studies did not find any gender differences.

Contrary to these findings on gender, some more consistent results have emerged regarding the degree to which ethnicity or being from a non-English speaking background is predictive of academic dishonesty (Marshall& Garry, 2006). Research has found that students from a non-English speaking background are more likely to engage in academic dishonesty (Marshall & Garry, 2006) and that non-White criminology students reported higher levels of academic dishonesty (Lambert & Hogan, 2004). One explanation for this may be that

students from minority backgrounds, especially those that exhibit weaker English language skills, may see academic life to be more stressful and feel less able to cope with academic expectations compared with other students (Wan, Chapman & Biggs, 1992). Nonetheless, there is research evidence to suggest that while international students are more likely to cheat in examinations, they are less likely to engage in academically dishonest practices in assignments that are written (Kremmer, Brimble, & Stevenson-Clarke, 2007), which suggests that there may be differences among types of academic dishonesty.

Eriksson and McGee (2015) opined that engagement in academic misconduct has also been associated with attitudes toward such behaviour. In theory, the expectation is that individuals who hold antisocial attitudes are more likely to engage in antisocial conduct when provided with the situation and opportunity to do so (Farrington, 2005). A number of studies indicate that students may be more likely to cheat when they view cheating as not unethical or not a serious form of misconduct (Bolin, 2004; Jensen, Arnett, Feldman & Cauffman, 2002; Salter, Guffey & McMillan, 2001; Tibbetts, 1998). For example, an examination of college students' moral evaluations of cheating behaviour in the United States showed that attitudes toward academic dishonesty accounted for nearly 40 % of the variation in academically dishonest behaviour (Bolin 2004). Similarly, examining high school and college students, Jensen *et al.* (2002) discovered that students who evaluated cheating leniently were more likely to be involved in cheating behaviour themselves. Thus, attitudes may play an important role in explaining cheating behaviour.

Students who overestimate peer involvement in academic misconduct may believe cheating to be the norm and therefore engage in this behaviour themselves (Conway *et al.* 2006). Hence, the involvement of peers in academic dishonesty is another contextual factor that can lead to student violations of academic integrity rules (Brimble and Stevenson-Clarke 2005; McCabe and Trevino 1997; Tibbetts 1998). This was a major finding of the research conducted by Tibbetts (1998), who observed that university students studying a criminal justice major were significantly more likely to cheat if they had colleagues or class mates that they knew had previously engaged in or continued to engage in test cheating. Similarly, using a vignette design, O'Rourke, Barnes, Deaton, Fulks, Ryan and Rettinger (2010) found that a students' decision to cheat was mainly determined by observing other students' cheating behaviour within the classroom setting.

According to Eriksson and McGee (2015) existing literature shows that concerning Australian criminal justice and policing students, academic dishonesty is more prevalent among the male gender, those from an ethnic minority and those with poor English language skills. The study also showed that attitudes towards academic dishonesty are related to engagement in cheating behaviours. Research has also revealed that if students believe that cheating behaviour is the norm within their academic institution they are more likely to engage in academic dishonesty.

Exploring the predictors of academic dishonesty amongst a sample of criminal justice and policing students enrolled at an Australian university using data obtained from a

questionnaire, the results suggest that male gender is an individual characteristic predictive of higher involvement in academic dishonesty (Eriksson & McGee, 2015). The results further suggest that considering academic dishonesty to be justified under certain circumstances is predictive of engagement in academic dishonesty. In addition, the results show that viewing academic dishonesty as less serious is a contextual factor predictive of academic dishonesty. A perception of peer engagement in academic dishonesty was not found to be predictive of student academic dishonest behaviour in Australian Universities. Language background, that is, having English as a second language which does not necessarily equate to low proficiency in the language, was not found to be predictive of engagement in academic dishonesty (Eriksson & McGee, 2015).

2.12 Government measures for controlling examination malpractices

According to Nwokora 2010, who assessed the implementation of government measures for controlling examination in Ebonyi State, Nigeria; the research utilised descriptive survey design. Principals and teachers in Ebonyi State comprised the population of the study. Six hundred participants (600) consisting of 396 teachers and 204 principals. A researcher developed questionnaire was used to obtain data for the study. The study investigated the extent to which government disciplinary measures control examination malpractices. Responses obtained from school principals and teachers showed that court trials, losing of jobs by principals, ten years ban on schools, rejection of blacklisted students by universities, recruitment on knowledge and experience, forfeiting of retirement benefits by officials and

withholding as well as cancellation of candidates results were effective measures by the government.

The study also revealed that giving of prizes to students, instilling teaching culture, recognizing the parents of the student, recognition of officials, and security agents by the state and public orientation by school administrators were effective government motivational measures for controlling examination malpractice. Nwokora (2010) reported that giving prizes to students with excellent performance by the school authority was rated very high by respondents. The following supervisory measures were found to be effective for controlling examination malpractices in schools: appointment of experienced supervisors, adequate hall accommodation, control of movement in examination halls, fixing nets on examination hall windows, providing conveniences and disallowing subject teachers from invigilating their own papers. Also, it was found that handing over of schools to missionaries in Ebonyi State was the most effective measure for controlling examination malpractices in the state. Organisation of seminars and conferences on dangers of examination malpractice, inclusion of examination ethics in the school prospectus and using mission workers as supervisors were effective religious measures for controlling examination malpractice.

2.13 Causes of Examination Malpractice

According to Joshua, Ekpoh, Edet, Joshua and Obo (2010), examination malpractice is caused by numerous factors; among which are student factors, school factors, undue emphasis on certificates and non-implementation of sanctions by government, environmental factors and poor library facilities. In majority of the cases, students were the main culprit in this matter. This is because laziness and lack of interest in academic work renders them unprepared for the examinations and coupled with the belief that some of them have been promised assistance from some quarters. Students who engage in examination malpractice often times have poor value orientation. They likely do not possess values like honesty, integrity, self-respect and hard work. Some students have made wrong choice of subject or career due to parental pressure, peer pressure and ignorance. This leads to poor preparation for examinations and poor performance in their academic work. Proprietors, teachers and school administrators perpetrate examination malpractice in order to make plenty money. When lazy teachers do not cover the syllabus before examination, they engage their students in examination malpractice so as to avoid being relieved of their appointments. There is undue emphasis on certificate qualifications in Nigeria. This deemphasizes acquisition of skills and other forms of training as a means of livelihood. Penalties stipulated for offenders are often not being implemented so as to act as deterrent to intending culprits. Poor and inadequate library facilities in schools make it impossible for students to prepare adequately for examinations.

2.14 Attitude to Examination Malpractice and Gender

There is a dearth of literature on attitude to examination malpractice and gender. Some researchers examined a few related issues. Athanason and Olasehinde (2002) analysed the results of literature reviewed and discovered the overall proportion of female students that cheated varied from a median of 0.56 and a median of 0.61 for male students. There was no significant difference in the proportions reported for male and female. After accumulating the findings of a number of studies it was reported that 21% of female gender and 26% of male cheated. This indicated that male persons are more likely to cheat in examinations than the female. However, Hill (1972) stated that girls cheated more frequently in some subjects like mathematics while boys cheated more in vocabulary tests.

It was reported by Minesota State University (2006) that out of four recent studies that included gender as a possible reason why people cheated, three studies found that male students were more likely to cheat while only one study found no significant correlation between gender and academic dishonesty.

Cornelius-Ukpepi and Erukoha (2012) investigated whether pupils' perception of examination malpractice differed by gender. The findings showed that there was no significant difference in pupils' perception of examination malpractice by gender. This means that perception of examination malpractice is independent of whether the student is a male or female. Gender did not determine perception of examination malpractice. On the contrary,

Good, Nichols and Sabers (1999) asserted that there was a difference in perception of cheating between male and female students.

Examination anxiety and poor study habits are some of those factors that may lead students to engage in examination malpractice. Ossai (2011) investigated the relationship between examination anxiety and students' attitude toward examination malpractice in tertiary institutions in Delta state. Students who are highly anxious lack concentration and so do not have sufficient knowledge of the course materials. They are more likely to be positively disposed towards engaging in Examination malpractice irrespective of gender (Ossai, 2011). Such students often engage in examination malpractice so that they do not end up with poor academic performance. His findings revealed that students with high examination anxiety were more predisposed to engage in examination malpractice. He also discovered that gender did not significantly moderate the relationship between examination anxiety and students' attitude to examination malpractice. This implied that both male and female students who manifested high anxiety levels had high tendencies of engaging in cheating.

The contradictory findings of researchers have shown that gender may or may not influence the cheating behaviour of students depending on the situation they find themselves.

2.15 Examination Malpractice and Student Self-assessment

There is virtually no literature (to the knowledge of the researcher) that relates student self-assessment to the Examination malpractice. Improving learning is a very important aspect of self-assessment. The reasons for self-assessment include the facilitation of student learning; making students reflective learners; equipping the students with formal accountability and accreditation of knowledge (Gunarwadana, 2010). The development of knowledge by the students and appreciation of criteria and standards to be applied to their work is one function of self-assessment. Another function of self-assessment is that it gives the students the capacity to make judgments about their work and determine if their work meets the standards set. Self-assessment enables students to evaluate their progress, develop communicative skills and increase their mathematical vocabulary (Gunarwadana, 2010). Nbina and Viko (2010) have confirmed that there is paucity of literature and student self-assessment is foreign to Nigerian culture. The focus of this research is to employ self-assessment to improve students' learning outcome in secondary school Chemistry. If self-assessment helps to facilitate students' learning, it then follows that it may prevent students from engaging in examination malpractice. Student self-assessment is hereby proffered as a panacea to examination malpractice.

2.16Consequences of Examination Malpractice

The effects of indulging in examination malpractice on the students, educational institution and the country as a whole are rather grave. Onyibe, Uma and Ibina (2015) observed that in a society with high incidence of examination malpractice, the feedback mechanism and the educational system become faulty and distorted. There is irreversible loss of credibility both at national and international levels. This implies that documents and certificates from Nigeria may be discriminated against and treated with suspicion. An individual, educational institution, the community and country all suffer the consequences of examination malpractice. Lack of self-confidence, loss of appointment or termination and dismissal bring failure and embarrassment to individuals, families and the nation. Those who go scot free are unable to perform well at their duty posts and defend their certificates. The practical effects of moral decadence emanating from examination malpractice manifest in bank frauds, collapse of buildings, economic sabotage, vandalism, kidnapping and hostage taking for ransom, drug trafficking and manufacture of fake drugs are all consequences of procuring certificates through examination malpractice. Onyibe *et al.* further stated that a person who passed through an educational institution characterised by academic fraud and dishonesty will certainly exhibit fraudulent behaviours in the organisation he finds himself. Onyibe, Uma and Ibina (2015) stressed that people who cheated to pass examinations, were most likely to cheat when they get employed, have a spouse and rig elections to win. Examination malpractice discourages students from working hard, encourages low productivity and poor job

performance, corruption, certificate racketeering and bribery. The negative effects of examination malpractice have adverse consequences on the social, economic and technological potentials of an individual and the Nigerian nation as a whole.

2.17 Managing Examination Malpractice

Certain strategies were recommended by some researchers for managing examination malpractice. Joshua (2008) suggested that students should make up their minds not to engage in examination malpractice. Parents and school owners should encourage hard work. School proprietors and government should recruit disciplined teachers who will refuse to be bribed for examination malpractice. Moral values should be inculcated in the students from a very tender age. The teaching professionals should be well motivated to discourage involvement in examination malpractice for monetary gains. School infrastructure should be improved to create a learning environment that is conducive for serious study. Stringent penalties should be imposed on the offenders (Joshua *et al*, 2010). The researcher opines that training students in self-assessment will minimize their tendency to engage in cheating if not totally eliminate examination malpractice.

2.18 The way out of Examination malpractice

Examination malpractice which started as a minor misdemeanour has bloomed into a hydra-headed problem that has characterized Nigerian Educational system. Efforts made by the

examination bodies, government and other concerned groups yielded little or no results. According to Jimoh (2009) laws, decrees, edits (Decree No. 27 of 1973, Act Cap 410, Examination Malpractice Act No. 33 of 1999) were enacted and promulgated to punish offenders in examination malpractice; but due to Nigerian factor, the penalties have not been effectively enforced. Jimoh (2009) suggested that only the creation of a special commission akin to Independent Corrupt Practices Commission (ICPC) and Economic and Financial Crimes Commission (EFCC) can adequately address this social malaise inimical to educational development in Nigeria. An Examination Malpractice Commission should be established to tackle this social problem. For such an organisation to function effectively it should be backed by law, devoid of government interference and independent so that there will be quick dispensation of justice.

Teachers should be empowered in order to curb examination malpractice. The government and private school owners should pay more attention to teacher professional development within a whole school development alongside a greater focus on curriculum, instruction and performance standard of the students (Badmus, 2006). The continuing education programme for teachers should be linked to curriculum change that could influence students' achievement. In the opinion of Badmus (2006), teachers' empowerment should also include their reward system and job environment. A welfare scheme that includes a robust salary structure and interesting job environment will enhance the teacher's commitment to his job.

Less emphasis should be placed on certificates and paper qualifications. Jimoh (2009) asserted that more emphases are placed on certificates instead of knowledge, skills and competencies. Some school leavers and dropouts have certificates without knowledge and skills. Some of the evils that occur in the society like collapsed buildings, production and sale of fake drugs by pharmacists, bank frauds and miscarriage of justice in law courts are all due to over emphasis on certificates. If this continues, bad medical doctors and lawyers may commit atrocities and “bury or jail” their clients to cover up for lack of skills and competencies. According to Jimoh (2009), emphasis in schools should be placed on skills and competence acquisition, continuous assessment of students should be properly implemented and there should be a value system re-orientation in Nigeria.

The Nigerian education sector should be adequately funded. Inadequate funding of the public schools is responsible for poor quality of education in the country. Jimoh (2009) declared that in the year 2003, out of a national budget of 765.1 billion Naira, only 13.9 billion (1.83%) was allocated to education. This is against United Nation’s Educational Scientific and Cultural Organisation’s (UNESCO) 26% recommendation. Inadequate funding which has resulted in excess workload and poor school facilities cause teachers to be affected by poor job satisfaction. With poor teaching and learning environment, the students indulge in academic fraud to cover the deficiency of under-funding. Improving on the funding of education will provide conducive teaching and learning environment and reduce examination malpractice.

All stakeholders in education should organize seminars and campaigns to sensitize people about the dangers of examination malpractice. Over time, this will help to positively change people's values and attitudes to this social problem. Moreover, the campaigns and seminars will help to restore moral values of hard work, honesty, uprightness and dedication which should characterise the Nigerian society (Jimoh, 2009).

Since examination malpractice is a hydra-headed social problem, it requires a multidimensional and collaborative approach by all stakeholders to resolving it. Hence, the researcher proffers infusion of self-assessment training into all school lessons so that a student who has acquired this skill will have no reason to indulge in cheating during examinations.

2.19 Attitude and Examination Malpractice

Yara (2009) defined attitude as a concept that is concerned with a person's way of thinking, acting and behaving. Attitude has very serious implications for the student and the teacher. He went on to say that attitudes can be formed as a result of some learning experiences. Attitude can also be acquired through mimicry or imitation. Hence, a student may copy his teacher's disposition to form his own attitude which in turn affects his learning outcomes.

Ossai (2011) asserted that based on the deficit model, test anxious students do not prepare adequately for examinations and so look for an easy way out. Such students engage in examination malpractice. Since the tendency to engage in examination malpractice is

premeditated or planned for; it is in consonance with the theory of planned behaviour and reasoned action. Ossai (2011) opined that there is a relationship between attitude, intention and behaviour as regards engagement in examination malpractice. He said positive attitude (disposition) towards examination malpractice leads to the intention to perform the act which in turn triggers the planning for the cheating behaviour at examinations.

2.20 Gender Disparity in Chemistry Learning Outcome

Inconsistent results have been obtained by different researchers on gender differences in Chemistry achievement. Some research works show the boys as significantly better than girls in Chemistry achievement. On the other hand, other studies show no significant difference. The difference in the performance of boys and girls has been attributed to unequal exposure of both gender to learning experiences that are relevant to their Chemistry learning (Nbina&Viko, 2010). Based on cultural misconceptions, the feminine gender is restricted from partaking in activities considered to be meant for the masculine gender. In his study on Gender differences in performance of Chemistry practical skills among senior six students in Kampala District, Ssempala (2005) reported that there was no statistically significant difference between girls and boys in their ability to manipulate the apparatus or equipment, make observation, report or record results correctly and compute, analyse or interpret results during the Chemistry class. According to Hudson (2012), many studies have agreed with the observation that male students outperform female students in assessments in the area of

Mathematics and science. During his study on gender differences in Chemistry performance, he investigated the relationship between gender, question type and question content. This study revealed that male students performed better than the girls in Chemistry examinations. The male students had a mean score of 76.4 while the female students had a lower mean score of 65.5. The difference in performance was attributed to the mathematical ability of the male students over the female students.

Udousoro (2011) studied the effects of gender and mathematics ability on academic performance of students in Chemistry. The results of the study revealed that there was no significant difference in the academic performance of male and female students in Chemistry. This implied that whether a student is male or female had no effect on the student's academic performance in Chemistry. This finding agreed with the views of Okon (2005) and Kano (2004) who reported that gender was not a significant factor in science achievement. The disparity in scores was attributed to changes in self-concept of girls about their ability to cope with the sciences. Amelink (2009) asserted in the study of gender differences in science performance that gender-biased classroom practice have been shown to negatively impact the performance of female students in science. Giving more attention to male students during science instruction, the teacher may unknowingly be sending the message that female students are less capable in the areas of Science, Technology, Engineering and Mathematics (STEM). Negative views held by gender biased stereotypes influence the number of women who pursue degrees in STEM fields. Stereotypical views held by some female students in a

male-dominated field may prevent women from pursuing career in science disciplines. This further manifests in fewer female role models in such disciplines. (National Research Council, 2006). Reports have suggested that women who study science courses at post-secondary level are likely to have strong family support, self-confidence, high expectations and appropriate academic preparation. The manner in which the subject matter is taught is another important factor that affects the science achievement of female students. Relating learning to students' previous experiences, collaborative learning, varying the level and type of questions asked during lessons, using inquiry based approaches that allow for hands-on manipulation of science material, employing a variety of assessment methods had positive impact on science achievement and incorporating instructional technology into lessons. Contrary to the findings of other researchers, Alonge, Adebule and Osundare (2015), compared the difficulty and discrimination indices of boys and girls in matching and completion test formats of Chemistry achievement test and the findings indicated that there was a significant difference in the performance of boys and girls in both test formats with the male performing better than their female counterparts. Therefore, this research study is concerned with investigating whether acquisition of student self-assessment skills would interact with gender to influence learning outcome in Chemistry.

2.21 Appraisal of Literature Review and Gaps in Knowledge

The study investigated the effects of student self-assessment on attitude to examination malpractice and learning outcome in senior secondary Chemistry. Relevant literature were reviewed on the contributions of Chemistry to scientific and technological development, the concept of student self-assessment and benefits to the student, procedures for conducting student self-assessment, attitude to examination malpractice, gender and attitude to examination malpractice and gender disparity in Chemistry achievement.

During student self-assessment, the teacher involves the student in identifying criteria and standards to apply to their studies and help them make judgement about the extent to which the criteria are met. The more knowledgeable other or teacher retains a varying degree of influence or assistance in the teaching-learning process to ensure that the learner achieves success. Findings from related literature reviewed showed that when students engage in self-assessment, they become aware of their strengths and weaknesses, focused and independent life-long learners. Student self-assessment has proven to improve learning and performance of students in English Language in foreign countries. However, in the researcher's opinion, very little is known about the effects of student self-assessment on Chemistry achievement particularly in the Nigerian context. There is a dearth of literature by Nigerian authors on the application of self-assessment. This provides the rationale for this study. Literature reviewed on examination malpractice has shown that there is a relationship between attitude, intention

and behaviour as it concerns examination malpractice. Positive attitude (disposition) towards examination malpractice leads to the intention to perform the act, which in turn makes the person to plan to exhibit the behaviour. Many authors have written about this hydra-headed monster called examination malpractice. Government has committed a lot of money, constituted fact finding committees, enacted laws and decrees to curb malpractices but to no avail. There is virtually no study (to the best of the researcher's knowledge) that has applied a cost effective method like student self-assessment training to solving the problem of examination malpractice. Hence, the relevance of this study. The researcher therefore proffers student self-assessment as a panacea to examination malpractice. Therefore, paucity of Nigerian literature and data on student self-assessment and its application to solving examination malpractice problem created a wide gap to be filled by this study.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter focused on the research design, area of the study, population, sample and sampling procedure, research instruments, validation of instruments, administration of instruments and statistical methods of data analysis.

3.1 Research Design

The research design adopted for this study was the quasi-experimental pre-test, post-test control group design. The quasi-experimental pre-test/post-test design was employed because it was not feasible to do random assignment of participants to experimental groups since participants were already in their intact classrooms. This design does not allow for random selection of participants in order to avoid the disruption of school activities. Also, the lack of stringent control associated with human participants characterises this design since participants could withdraw at any time from the study without penalty. This design comprised two intact groups. One group was subjected to the self-assessment training while the second group served as the control. Both groups were studied in parallel as pre-test and post-test were administered on them.

Experimental group: $O_1 X O_2$

Control group: $O_3 C O_4$

O_1, O_3 represent the pre-tests administered to experimental and control groups.

O₂, O₄ represent the post-tests administered to the groups

X denotes self-assessment training for the experimental group, while C stands for the control group.

3.2 Dependent Variables:

The dependent variables include Learning Outcome in Chemistry, (that is, Chemistry Achievement Test Scores) and Attitude to Examination Malpractice scores.

3.3 Independent Variable:

The independent variable in this study is Student self-assessment training (Experimental conditions).

3.4 Moderating Variable:

The moderating variable is gender (male and female).

3.5 The Study Area

This study was carried out in Ogun state. Ogun state was chosen for this study because of the need to improve Chemistry achievement and curb examination malpractices in the state.

There are one hundred and seventy-six (176) public secondary schools and two hundred and fifty-four (254) private secondary schools in Ogun State. Ogun State was created in 1976 and named after the Ogun River which runs across from north to south. It is located in south-western Nigeria and its border with Benin Republic makes it an access route to the expansive market of the Economic Community of West African states (ECOWAS). The capital of Ogun State is Abeokuta. There are twenty Local Government Areas and twenty educational zones.

The major Nigerian ethnic tribes are well represented in the state. The people of Ogun State belong to the Yoruba Ethnic group. The sub-groups are the Egba, Ijebu, Yewa/Awori, Egun and Remo. Ogun state is situated between Latitudes 6.3°N and 7.8°N ; Longitudes of 3.0°E and 5.0°E . It is bound on the west by Benin Republic, on the south by Lagos State and the Atlantic Ocean, on the east by Ondo State and on the north by Oyo and Osun States. Some of the traditional festivals of Ogun State are: Oro, Ogun, Agemo, Ojude-Oba, Oro, Gelede, Obirin-Ojowu, Orisa-Oko, Egungun and Sango. Evergreen forest vegetation characterises Ogun State and is blessed with rich soil suitable for cultivation of food and cash crops like palm oil, rice, kola-nut, cocoa, cotton, cassava, cocoyam, yam and vegetables. However, the northern part has a vast grazing savannah land for animal husbandry. The southern part of Ogun State has a beautiful ocean front that serves as a beach resort. The State has extensive limestone deposits, chalk, phosphate, high quality stones, gypsum and bitumen. The most prominent tourist centres are the Olumo Rock at Abeokuta and Birikisu Osungbo Shrine at Ijebu-Ode. Ogun State, just like Lagos State, has a unique characteristic population where major tribes in Nigeria are found. The land mass area is approximately 1,640,926 square kilometres. The projected population as at 2011 census is 4, 397,604 people. (Ogun State Government Nigeria, OGS 2016 www.ogunstate.gov.ng).



Figure 5: Location of Ogun State in Nigeria

(Source: Ogun State Government Nigeria, OGS 2016 www.ogunstate.gov.ng).

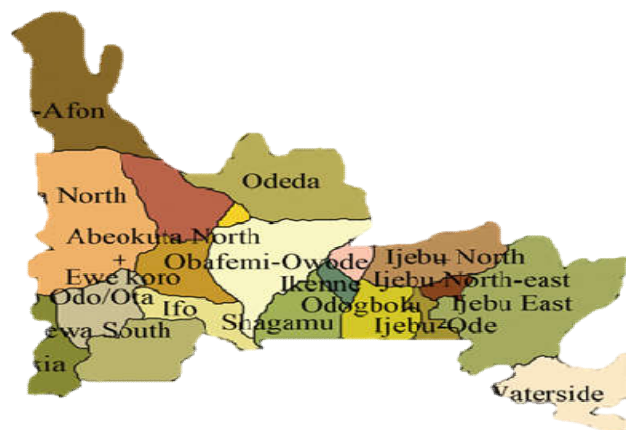


Figure 6: Map of Ogun State showing Local Governments.

(Source: Ogun State Government Nigeria, OGS 2016 www.ogunstate.gov.ng).

3.6 Population of the study

The population for the study comprised all Senior Secondary two (SS II) Chemistry students in public Co-educational Senior Secondary Schools in Ogun state. Co-educational secondary schools formed the population of this study because they had a good representation of the male and female gender. The Senior Secondary Two students were chosen because they were not sitting for public examinations and they will have the opportunity to apply the knowledge and skills acquired from the self-assessment training before graduation.

3.7 Sample and Sampling procedure

The sample consisted of one hundred and eighty-four (184) SS II students (110 male and 74 female). The study utilized multistage sampling process. Simple random sampling was used to select two educational zones out of the twenty zones. Then, all the public co-educational senior secondary schools in each of the two zones were listed out. A simple random sampling method (hat and draw) was used to select two schools from each of the two zones. Out of the four schools, random sampling method was also used to select two schools to serve as the training group while the other two schools served as the control group. These schools were labelled A, B, C and D, to ensure confidentiality. One stream of SSII Chemistry classes was randomly chosen from each school. One stream of SS II Chemistry class was randomly selected in schools that had more streams of extremely large class size for easy class management. Intact classes were used to avoid disorganising the school and to ensure that

every participant benefited from the training. The initial sample comprised 218 students. The researcher administered a Chemistry Achievement Test (an equivalent form) on all the SS II Chemistry students in the four schools as the pre-test. At the end of the self-assessment training, due to experimental mortality, (that is, voluntary withdrawal and incomplete responses of participants) 184 SS II students, comprising 110 male and 74 female completed the study. Table 4 shows their distribution.

Table 4: Distribution of Participants by Experimental conditions, School, Age and Gender.

| GROUPS | SCHOOLS | MEAN AGE | MALE | FEMALE | TOTAL |
|--------------|---------|--------------|------------|-----------|------------|
| EXPERIMENTAL | A | 15.54 | 40 | 34 | 74 |
| | B | 15.68 | 13 | 9 | 22 |
| CONTROL | C | 15.79 | 27 | 13 | 40 |
| | D | 15.91 | 30 | 18 | 48 |
| TOTAL | | 15.73 | 110 | 74 | 184 |

3.8Research Instruments

The following instruments were utilized by the researcher to obtain data for this study:

- Student Self-assessment Scale in Chemistry (SSASC).
- Chemistry Achievement Test (CAT).
- Attitude to Examination Malpractice Scale (AEMS).

(a) Student Self-Assessment Scale in Chemistry (SSASC):

This is a 20-item instrument developed by the researcher to measure student self-assessment skills. SSASC focused on students' ability to critique oneself, unbiased grading, active class participation, building one's confidence and overcoming one's weaknesses in Chemistry learning. Inspiration for development of this instrument was drawn from studies by Gunawardena (2010), Orsmond (2004) and Ross (2006). The participants self-reported on the degree to which they were able to use the self-assessment techniques to solve questions in Chemistry. Provisions were made on this instrument for the participants to indicate their gender and ages. The instrument has Cronbach's Alpha reliability of 0.87. It was scored on a four point Likert-type rating scale. The score for the responses were strongly agree (SA=4), agree (A=3), disagree, (D=2) and strongly disagree (SD=1) for positive statements. The order of the scores was reversed for negative statements, thus: SA=1, A=2, D=3, SD=4. A high score indicates possession of high self-assessment skills by the respondents. The minimum score is 20 while the maximum is 80. Below are samples from SSASC:

Table 5: Student Self-Assessment Scale in Chemistry, SSASC.

| S/N | ITEMS | SA | A | D | SD |
|-----|--|----|---|---|----|
| 1 | Marking my own Chemistry exercises using the marking criteria makes me learn Chemistry more. | | | | |
| 2 | Grading my own work using the Chemistry marking guide enables me to think well. | | | | |
| 3 | Self-assessment skills help to increase my confidence in Chemistry learning. | | | | |

(b) Chemistry Achievement Test (CAT)

The CAT consist of fifty multiple choice and five theory Chemistry questions based on topics that the participants had been taught by the researcher as prescribed in the Ogun state SSII syllabus in Chemistry for the third term (2014/2015 session). It is important to note that all questions were based on Organic Chemistry because those were the topics listed in the third term scheme of work by the Ogun State Ministry of Education. The questions were constructed using a test blue print shown in table 6. There were five options for each question. A test blue print helped to ensure that content validity was achieved. Eighty (80) test items were initially constructed. The test items were refined by subjecting them to item analysis. Item analysis involved calculating index of difficulty and index of discrimination of each test item. The indices of difficulty ranging from (0.40) 40% to (0.60) 60% were considered good; while discrimination indices of above +0.30 were equally good. The effectiveness of the distracters were also ensured. The good items from the item analysis were then used for pilot study to obtain their psychometric properties. Equivalent forms of CAT used for pre-test and post-test were constructed using the same table of specification. The reliability coefficients for the equivalent forms were 0.79 and 0.80. CAT carried a total of 100 marks.

Table 6: Test Blue Print for Chemistry Achievement Test

| Content | Weight | Knowledge 40% | Comprehension 30% | Application 30% | Total 100% |
|--|-------------|------------------|----------------------|--------------------|---------------|
| Introduction to Organic Chemistry | 10% | 2 | 2 | 1 | 5 |
| Saturated and Unsaturated Hydrocarbons | 30% | 6 | 5 | 4 | 15 |
| Aromatic Hydrocarbons | 20% | 4 | 3 | 3 | 10 |
| Alkanols | 30% | 6 | 4 | 5 | 15 |
| Petroleum | 10% | 2 | 1 | 2 | 5 |
| Total | 100% | 20 | 15 | 15 | 50 |

Examples of items from the CAT are shown below:

1. The exceptionally large number of carbon compounds is essentially due to the ability of

(A) carbon to catenate liberally.

(B) various groups to catenate.

(C) nitrogen, phosphorous and the halogens to catenate with themselves.

(D) hydrocarbons to dominate other groups

(E) carbon to multiply with the halogens.

2. The functional group of the Alkanols is

(A) $C_nH_{2n+1}OH$

(B) C_nH_{2n-2}

(C) amine group

(D) carboxylic group

(E) hydroxyl group.

(c) Attitude to Examination Malpractice Scale (AEMS)

The 16-item AEMS, which was also researcher designed was used to elicit information on students' disposition to examination malpractice. The researcher generated the items on AEMS from a bank of indicators of students' attitude and items drawn as in the scale of attitude towards Mathematics by Obe (2002) with a reliability of 0.80. Twenty five items were initially constructed. This was subjected to pilot study in order to determine the psychometric properties and weed out ambiguous items. It has Cronbach's Alpha reliability of 0.90. AEMS was scored on a four point Likert-type scale and the responses ranged from strongly agree (SA=4), agree (A=3), disagree (D=2) and strongly disagree (SD=1). A higher overall score indicates a greater tendency to engage in examination malpractice. The minimum score obtainable is 16 while the maximum is 64. The following are a few examples of items from the AEMS instrument:

Table 7: Attitude to Examination Malpractice Scale, AEMS

| S/N | ITEMS | SA | A | D | SD |
|-----|--|----|---|---|----|
| 1 | I like to cheat during examinations. | | | | |
| 2 | I do not like to study very well before examinations. | | | | |
| 3 | I do not like to ask my friends to teach me during examinations. | | | | |

3.9 Pilot Study

The researcher carried out a pilot study with the aim of eliminating any weakness or ambiguity so as to correct them before the actual data collection was done. Thirty (30) students consisting of fifteen (15) boys and fifteen (15) girls selected through stratified sampling participated in the pilot study. The pilot study was carried out in a school that was in an Educational Zone other than the one in which the real study was done. The school used for pilot study possessed similar characteristics as the schools used in the actual study.

Validity and Reliability

Draft copies of the questionnaires were given to the researcher's supervisors, lecturers in Measurement and Evaluation and Chemistry teachers who teach SS II classes to ensure content validity. Comments from the lecturers, supervisors and subject teachers were used to modify the instruments. The psychometric properties of the SSASC, CAT and AEMS were determined using Cronbach's Alpha statistics as shown below and adjudged to be suitable for the real study. Content validity of the Chemistry achievement test (CAT) was specifically ensured by the researcher's supervisors, the use of a test blue print and item analysis.

Table 8: Cronbach's Alpha Reliability Coefficient of Research instruments

| <i>Instrument</i> | <i>Number of items</i> | <i>Reliability</i> |
|---|------------------------|--------------------|
| Student Self-assessment Scale in Chemistry (SSASC) | 20 | 0.87 |
| Attitude to Examination Malpractice Scale (AEMS) | 16 | 0.90 |
| Chemistry Achievement Test (CAT) | 50 | 0.79 |

3.10 Procedure for Data Collection

A letter of introduction was obtained from the Head, Department of Educational Foundations of the University of Lagos. The letter was used to seek permission from the Ogun State Ministry of Education and the principals to use the selected schools for the research study.

3.11 Training of Research Assistants

Four Chemistry teachers who were university graduates and who have taught for at least five years from the selected schools were utilized as research assistants. They were trained for one-and-half hours for two days. The purpose of the study was explained to them because the researcher needed their cooperation for a successful study. They assisted the researcher during the self-assessment training process and in the administration of the instruments.

3.12 Administration of Instruments

The study was carried out in three phases for a period of ten weeks. The first week was used to administer the instruments (pre-test) before the training and the last week was used to administer the instruments again after the training was completed. Venue of training was in the schools using lesson periods. The researcher spent two days (sometimes three) per week in each school. In order to ensure that both experimental and control groups were properly equated, the same lesson notes, instructional materials and syllabus drawn from the Ogun state curriculum were used in teaching. The participants were also of comparable ages and abilities and were both taught in the morning and afternoon. This study was carried out within the normal Chemistry lesson periods of the schools' timetable.

Phase I: Pre-training stage

The researcher was introduced to the students as an experienced Chemistry teacher and Educational Consultant whose mission was to equip the students with skills necessary for them to excel in their study of Chemistry. The researcher then administered the AEMS, SSASC and CAT to obtain pre-training data.

Phase II: Training stage

The training was done twice a week for duration of eight weeks. Each session lasted for eighty (80) minutes (except for the familiarization week), that is, double lesson period. The control group did not receive the self-assessment training but their normal Chemistry classes.

Phase III: Post-training stage

At the end of the training (the 10th week), the researcher administered equivalent forms of the SSASC, AEMS and CAT to both the control and training group participants to obtain post-training data. Equivalent forms were used to obliterate the effect of practice or familiarity on respondents' answers.

3.13 Training Package for Student Self-assessment

Student Self-assessment Instructional Guide or rubric (SSIG)

The SSIG developed by the researcher, was used to teach the students how to set reasonable goals and to systematically assess themselves as they worked towards achieving those goals in Chemistry learning. The strategies for learning self-assessment were explained to the participants thus:

- I. Researcher involved the students in defining assessment criteria.
- II. Students were taught how to apply the criteria. For instance, model application of the rubrics by assessing a sample of performance.
- III. Researcher gave students feedback on self-assessment. For example, engaged students in evidence-based discussions of the differences between self-assessment and assessment by others.
- IV. Students were helped by the researcher to use data to develop action plan. For instance, find trends in performance and identify short and long term strategies for overcoming weaknesses (Ross, 2006).

Week one: Familiarization or Establishing rapport

A relaxed atmosphere was created by exchanging pleasantries with participants. The researcher was introduced to the students and tried to ascertain what topics the students had covered by asking them to mention the topics. Simple questions were posed at the students on previous topics and they were applauded for correct answers. This activity helped to boost their confidence in readiness for the self-assessment training. The syllabus was used to extract the lesson content and goals. Participants were given an outline of the content of the training package.

Week two: Definition of criteria

The researcher involved the students in defining the criteria that would be used to judge their performance. The students brainstormed on the criteria. The researcher and students negotiated the criteria. Then, the researcher used students' language to co-develop the standards.

Week three: Application of criteria

The researcher taught the students to apply the criteria to their own work by showing them examples. Students were guided in using the criteria following the examples given. The weighting of the different criteria was determined with the students. A different level of performance for each criterion was determined using different words or phrases to distinguish

between the levels such as: poor, fair, good, excellent or 1, 2, 3, and 4 respectively. See appendices.

Week four: Applying Self-assessment to “Introduction to Organic Chemistry”

Having designed the scoring guide or rubric on the topic “Organic Chemistry” with the students the researcher revised the previous week’s work with the students. The sub-topics were explicitly explained to the participants using instructional materials like charts and models of electronic configuration of carbon atom. Participants did some exercises in the class. The researcher gave the participants a copy each of the scoring guide, score sheet and future plan schedule to enable them assess themselves (see appendix: A, B and C). Class work was drawn from the lesson taught. Reference books: *Essential Chemistry for Senior Secondary* (Odesina, 2008) and *New School Chemistry for Senior Secondary* (Osei, 2010).

Week five/six: Applying Self-assessment to “Saturated and unsaturated Hydrocarbons”

The previous week’s lesson was reviewed with the participants after which the new topic was introduced. Two weeks were spent teaching the students alkane, alkene and alkynes. These topics were explicitly explained using diagrams, charts, models and simple demonstrations. Class work was given to the students after which copies of the scoring guide, score sheet and future plan schedule was distributed to enable the participants do self-assessment.

Week seven: Applying Self-assessment to “Aromatic Hydrocarbons”

The researcher revised the last lesson before introducing the new topic: aromatic hydrocarbons. The researcher taught benzene, benzene derivatives and their uses were also explained. Class exercise was given to test participant’s level of understanding. The scoring guide, score sheet and future plan schedule were given to participants to enable them assess themselves.

Week eight: Applying Self-assessment to “Alkanols”

The previous lesson was revised with the participants by the researcher before introducing the new topic. Some of the topics covered under alkanols are: primary, secondary and tertiary alcohols. The researcher drew the participants’ attention to real life examples like local production of “ogogoro” (local gin). Participants were given class work to do. Then, they were asked to self-assess themselves with the scoring guide, score sheet and future plan schedule.

Week nine: Applying Self-assessment to “Petroleum (crude oil)”

The participants were asked to summarise the last lesson before introducing the new topic. Origin and composition, exploration, drilling, petrochemicals and liquefied natural gas, were taught using real life examples like synthetic production of nylon, fibres, insecticides, fertilizers and cooking gas. The students were asked to mention the uses and importance of

these products derived from petroleum. Participants were given class work to do. Then, they were asked to self-assess themselves with the scoring guide, score sheet and future plan schedule.

Week ten: Review, Post-test and Closing. The entire training process was reviewed with the students. They were encouraged to continue to implement the self-assessment skills acquired as part of their study habit. The researcher re-administered the SSASC, AEMS and CAT to both the control and training group participants to obtain post-training data. The researcher helped the students to develop productive goals and further action plan. Researcher helped the students to identify their strengths and weaknesses using the comparative data. Students were helped to generate their goals. Researcher guided the students to develop specific action plan towards goal attainment. The goals and action plans of the students were recorded. The goal sheets provided a written record that could be referred to in the future to help the students to monitor their progress and achievement. The rubric could then be modified before using it on another occasion.

3.14 Control Group

The researcher established rapport with the participants. The pre-test was administered on them. Since the control group is the waiting group, they received their normal Chemistry lessons without self-assessment procedures. They had no idea what the experimental group did. At the end of the whole process, post-test was administered on the control group.

3.15 Methods of Data Analysis

Descriptive and inferential statistics were employed in analysing data obtained from the participants. Hypotheses 1, 3 and 4 were tested using one-way Analysis of Covariance (ANCOVA); hypotheses 2 and 5 were tested using two-way Analysis of Covariance (ANCOVA).

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF RESULTS

This chapter presents the results of analyses of all data collected in this study. The hypotheses were analysed and discussed in the order they were presented in the first chapter.

4.1 Testing of Hypothesis One

Hypothesis One: There is no significant difference in Chemistry post-test learning outcome scores of students who were exposed to self-assessment training and those who were not. The hypothesis was tested using one way analysis of covariance.

Table 9: Descriptive Data of Pre and Post CAT scores in the Experimental and Control groups

| GROUP | N | Pre test | | Post test | | Mean Diff | Mean Deviation |
|-----------------|------------|--------------|-------------|--------------|--------------|--------------|----------------|
| | | Mean | SD | Mean | SD | | |
| Self-assessment | 96 | 23.61 | 2.75 | 64.9 | 6.3 | 41.29 | 17.76 |
| Control | 88 | 22.77 | 2.09 | 27.76 | 3.47 | 4.99 | -19.38 |
| TOTAL | 184 | 23.21 | 2.49 | 47.14 | 19.29 | 23.93 | |

Table 9 shows that participants in the self-assessment group had a higher mean difference of 41.29 in the Chemistry Achievement Test (CAT) while participants in the control group had a lower mean difference of 4.99. Table 9 further shows that participants in self-assessment training group recorded a mean deviation value of 17.76 above the group mean value of

47.14 while the control group had a negative mean deviation of -19.38 below the group mean. This implies that participants in the experimental group recorded (good) post CAT scores that were 17.76 higher than the group mean while the control group participants had (poor) post CAT scores below the group mean. To determine whether a significant difference exists between the groups, One-way Analysis of Covariance was done and the result is presented in Table 10.

Table 10: ANCOVA Test of difference in Post Chemistry Achievement Test Scores between Training and Control Groups.

| Source | Type III Sum of Squares | df | Mean Square | F | P-value. |
|-----------------|-------------------------------|-----|----------------|---------|--------------------|
| Corrected Model | 63333.5 | 2 | 31666.8 | 1196.07 | .000* |
| Intercept | 3756.05 | 1 | 3756.05 | 141.868 | .000* |
| Covariate | 20.865 | 1 | 20.865 | 0.788 | .376 ^{ns} |
| Group | 61107 | 1 | 61107 | 2308.05 | .000* |
| Error | 4792.08 | 181 | 26.476 | | |
| Total | 476935 | 184 | | | |
| Corrected Total | 68125.6 | 183 | | | |

*significant at 0.05; df = 1 & 181; critical F = 3.89; ns = not significant

Evidence from table 10 shows significant effect of the self-assessment training on post-test CAT after controlling for the effect of confounding variables, $F(1,181) = 2308.05$, $P = 0.00 < 0.05$ level of significance. The null hypothesis was rejected. This implies that a significant difference exists in the post test Chemistry scores of students exposed to self-assessment training compared to those who were not. This suggests that training on self-assessment

enhanced better performance in Chemistry Achievement scores of the participants. A cursory look at table 10 further reveals that there is no significant difference in the covariate (pre-test scores) with $F(1,181)= 0.788$, $P=0.376 >0.05$ level of significance. This implies that the experimental and control groups were homogenous at the commencement of the study. Due to the significant difference in post-test CAT between the two groups, LSD (Least Significant Difference) post hoc pair wise comparison was done to determine the source of the difference.

Table 11: LSD Post Hoc Pairwise comparison of difference in Chemistry Achievement Test due to Self-assessment Training

| (I) Experimental and (J)Control | | Mean Difference (I-J) | Std. Error | p- value. |
|------------------------------------|--------------|-----------------------------|---------------|--------------|
| Experimental | Control | 37.018* | 0.771 | .000 |
| Control | Experimental | -37.018* | 0.771 | .000 |

*. The mean difference is significant at the .05 level.

The LSD post hoc analysis in table 11 reveals that students exposed to self-assessment training had higher post test scores in CAT than those who were not exposed to the training (mean difference=37.018; $P<0.05$). This suggests why participants in the experimental group performed better than the control group because the self-assessment training was effective.

4.2 Testing of Hypothesis Two

Hypothesis Two: Post-test Chemistry learning outcome scores was not significantly different between male and female students in the training and control groups. This hypothesis was tested using a 2x2 analysis of covariance, with training and control on one hand; male and female on the other.

Table 12: Descriptive data of the Effects of Experimental conditions and Gender on Post-test Chemistry Achievement Test

| Experimental and Control | Gender | N | Pre test | | Post test | | Mean Diff | Mean Deviation |
|--------------------------|--------------|------------|--------------|-------------|--------------|--------------|--------------|----------------|
| | | | Mean | SD | Mean | SD | | |
| Experimental | Male | 53 | 23.94 | 2.94 | 65.13 | 6.21 | 41.19 | 0.23 |
| | Female | 43 | 23.21 | 2.47 | 64.6 | 6.46 | 41.4 | -0.3 |
| | Total | 96 | 23.61 | 2.75 | 64.9 | 6.3 | 41.29 | |
| Control | Male | 57 | 22.68 | 1.88 | 28.04 | 3.75 | 5.36 | 0.28 |
| | Female | 31 | 22.94 | 2.45 | 27.26 | 2.86 | 4.32 | -0.5 |
| | Total | 88 | 22.77 | 2.09 | 27.76 | 3.47 | 4.99 | |
| Total | Male | 110 | 23.29 | 2.52 | 45.91 | 19.3 | 22.62 | -1.23 |
| | Female | 74 | 23.09 | 2.45 | 48.96 | 19.28 | 25.89 | 1.82 |
| | Total | 184 | 23.21 | 2.49 | 47.14 | 19.29 | 23.93 | |

Table 12 displays the descriptive data of the effects of gender and experimental conditions on post-test Chemistry Achievement Test. Evidence from the table shows that male and female students in the experimental group had a higher mean score of 65.13 and 64.60 respectively, while those in the control group had a lower mean score of 28.04 and 27.26 respectively.

Also, the mean deviation values show that male and female participants in the experimental group recorded 0.23 and -0.3 above and below the group mean (64.9) in post CAT while male and female participants in the control group had 0.28 and -0.5 mean deviations higher and lower than group mean (27.76). The male and female students in the experimental group did better than their counterparts in the control group due to the effectiveness of the training. ANCOVA was used to ascertain if a significant difference existed in post-test CAT due to gender and experimental conditions.

Table 13: 2x2 ANCOVA of Gender and Experimental Conditions on Post CAT

| Source | Type III Sum of Squares | Df | Mean Square | F | P-value. |
|-----------------|-------------------------|-----|-------------|----------|--------------------|
| Corrected Model | 63351.073 | 4 | 15837.768 | 593.767 | .000* |
| Intercept | 3706.482 | 1 | 3706.482 | 138.958 | .000* |
| Covariate | 19.689 | 1 | 19.689 | .738 | .391 ^{ns} |
| Group | 58570.846 | 1 | 58570.846 | 2195.856 | .000* |
| Gender | 16.671 | 1 | 16.671 | .625 | .430 ^{ns} |
| Group * Gender | 1.575 | 1 | 1.575 | .059 | .808 ^{ns} |
| Error | 4774.531 | 179 | 26.673 | | |
| Total | 476935.000 | 184 | | | |
| Corrected Total | 68125.603 | 183 | | | |

Df=1&179; critical F= 3.89; *significant at 0.05; ns= not significant

A cursory look at table 13 indicates that gender had no significant effect on post-test CAT scores of the participants as the calculated $F= 0.625 (1,179)$, $p= 0.430 > 0.05$ level of significance. The interaction effect of gender and experimental conditions showed a calculated $F= 0.059 (1,179)$, $p=0.808 > 0.05$ level of significance, implying that gender and

experimental conditions had no significant interaction effect on post-test CAT. Hypothesis two was retained or accepted. The covariate (pre-test scores) indicated no significant difference, $F=0.738$ (1,179), $P=0.391>0.05$ level of significance; therefore, confirming the homogeneity of the experimental and control groups at the beginning of the study. It was concluded that there was no significant difference in the post-test CAT scores of the male and female participants in the training and control groups.

4.3 Testing of Hypothesis Three

Hypothesis Three There is no significant difference in the post test self-assessment scores between the experimental and the control groups.

Table 14: Descriptive data of Pre and Post SSASC Scores of participants in the Experimental and Control Groups

| Experimental and Control | N | Pre test | | Post test | | Mean Diff | Mean Deviation |
|--------------------------|------------|--------------|-------------|--------------|--------------|--------------|----------------|
| | | Mean | SD | Mean | SD | | |
| Experimental | 96 | 30.67 | 4.31 | 67.68 | 7.16 | 37.01 | 17.54 |
| Control | 88 | 30.36 | 5.94 | 31.01 | 6.62 | 0.65 | -19.13 |
| Total | 184 | 30.52 | 5.15 | 50.14 | 19.61 | 19.62 | |

Table14 shows that students who were exposed to self-assessment training had a higher mean difference of 37.01 as compared to 0.65 obtained for the control group. Also, table 14 further reveals thatthe experimental and control groups recorded a mean deviation of 17.54 and -

19.13 above and below the group mean of 50.14. The implication is that the experimental group acquired better self-assessment skills than the control group. One-way ANCOVA was used to determine if any significant difference existed due to experimental conditions. The results are presented in Table 15.

Table 15: ANCOVA Test of Difference in Post SSASC scores between Experimental and Control Groups

| Source | Type III Sum | Df | Mean | F | P-value. |
|-----------------|--------------|-----|-----------|----------|----------|
| | of Squares | | Square | | |
| Corrected Model | 62569.869 | 2 | 31284.934 | 722.409 | .000* |
| Intercept | 6770.471 | 1 | 6770.471 | 156.339 | .000* |
| Covariate | 845.521 | 1 | 845.521 | 19.524 | .000* |
| Group | 61245.393 | 1 | 61245.393 | 1414.234 | .000* |
| Error | 7838.457 | 181 | 43.306 | | |
| Total | 533012.000 | 184 | | | |
| Corrected Total | 70408.326 | 183 | | | |

*Significant at $p < 0.05$; Df= 1&181; critical F= 3.89

The data in table 15 shows that a calculated $F = 1414.234 (1,181)$, $p = 0.000 < 0.05$ level of significance; the hypothesis was rejected. This suggests that a significant difference existed in the post self-assessment scores of the participants in the training and control groups. LSD

post hoc pair-wise comparison was done to determine the source of the difference. The results are shown in table 16.

Table 16: LSD Post-hoc Pair-wise comparison of difference in Post-test SSASC scores between experimental and control groups.

| (I) Experimental and (J) Control | | Mean Difference (I- J) | Std. Error | P-value. |
|-------------------------------------|--------------|---------------------------|------------|----------|
| Experimental | Control | 36.539* | .972 | .000 |
| Control | Experimental | -36.539* | .972 | .000 |

*. The mean difference is significant at the .05 level.

Evidence from Table 16 LSD post hoc test shows that participants who received the self-assessment training had higher mean difference in SSASC when compared to those who did not undergo the training (mean difference =36.539; $P < 0.05$). This further shows that the students who were exposed to the training acquired more self-assessment skills than the control group.

4.4 Testing of Hypothesis Four

Hypothesis Four: There is no significant difference in students' attitude to examination malpractice between the self-assessment training and control groups. This hypothesis was tested using one way ANCOVA.

Table 17: Descriptive Data of pre and post Attitude to Examination Malpractice (AEMS) of participants in the Experimental and Control groups.

| Experimental and Control | N | Pre test | | Post test | | Mean Diff | Mean Deviation |
|--------------------------|------------|--------------|-------------|--------------|--------------|---------------|----------------|
| | | Mean | SD | Mean | SD | | |
| Experimental | 96 | 56.24 | 5.91 | 24.43 | 5.67 | -31.81 | -16.39 |
| Control | 88 | 56.14 | 3.13 | 58.7 | 3.07 | 2.56 | 17.88 |
| Total | 184 | 56.19 | 4.78 | 40.82 | 17.78 | -15.37 | |

Evidence from the table 17 reveals that the students who were exposed to the self-assessment training in the experimental group had a lower mean difference of -31.81 in their post-test attitude to examination malpractice scores as compared to the control group with a higher mean difference of 2.56. A cursory look at table 17 shows that the experimental group recorded a negative mean deviation of -16.39 while the control group had a value of 17.88 respectively, below and above the group mean of 40.82. It appears that the experimental group has a negative attitude towards examination malpractice while the control group has a positive attitude towards examination malpractice. One-way ANCOVA was used to determine whether a significant difference existed between the groups.

Table 18: ANCOVA Test of difference in Post Attitude to Examination Malpractice between the Training and Control Groups.

| Type III Sum | | | | | |
|-----------------|------------|-----|-------------|----------|----------|
| Source | of Squares | df | Mean Square | F | P-value. |
| Corrected Model | 54029.974 | 2 | 27014.987 | 1288.425 | .000* |
| Intercept | 1479.373 | 1 | 1479.373 | 70.556 | .000* |
| Covariate | 84.700 | 1 | 84.700 | 4.040 | .046* |
| Group | 53985.230 | 1 | 53985.230 | 2574.717 | .000* |
| Error | 3795.108 | 181 | 20.967 | | |
| Total | 364429.000 | 184 | | | |
| Corrected Total | 57825.082 | 183 | | | |

*Significant at 0.05:Df=1&181; critical F=3.89

Table 18 shows that for experimental conditions, a calculated $F = 2574.717 (1, 181)$, $p = 0.000 < 0.05$ level of significance was obtained. The null hypothesis was rejected because of the significant difference. Post-test AEMS scores of students in the training group significantly differed from those who did not receive training. This implied that the self-assessment training enhanced negative attitude of the experimental group towards examination malpractice. Students' self-assessment has helped the students develop a negative attitude to examination malpractice.

Table 19: LSD Post Hoc Pair-wise comparison of difference in Post Attitude to Examination Malpractice due to Experimental conditions.

| (I) | | Mean | Std. | |
|------------------------------|--------------|----------------------|-------|----------|
| Experimental and (J) Control | | Difference (I-J) | Error | P-value. |
| Experimental | Control | -34.292 [*] | .676 | .000 |
| Control | Experimental | 34.292 [*] | .676 | .000 |

*. The mean difference is significant at the .05 level.

Evidence from table 19 revealed that students exposed to the self-assessment training had a lower mean difference (-34.292; $P < 0.05$) in their post-test AEMS scores when compared to those who did not undergo the training. It was therefore concluded that participants in the training group had developed negative attitude to examination malpractice as a result of the self-assessment training.

4.5 Testing of Hypothesis Five

Hypothesis Five: Gender and experimental conditions (self-assessment training) have no significant interaction effect on participant's attitude to examination malpractice. This hypothesis was tested using a 2x2 ANCOVA because the post-test Attitude to Examination Malpractice scores of participants was compared on two levels- between gender (male and female) and experimental conditions (training and control). The results obtained are displayed in table 20.

Table 20: Descriptive data of the effect of Gender and Experimental conditions on Post Attitude to Examination Malpractice of participants

| Experimental | | N | Pre test | | Post test | | Mean Diff | Mean Deviation |
|--------------|--------------|------------|--------------|-------------|--------------|--------------|---------------|-------------------|
| and Control | Gender | | Mean | SD | Mean | SD | | |
| | | | | | | | | |
| Experimental | Male | 53 | 57.06 | 6.15 | 25.62 | 6.19 | -31.44 | 1.19 |
| | Female | 43 | 55.23 | 5.52 | 22.95 | 4.62 | -32.28 | -1.48 |
| | Total | 96 | 56.24 | 5.91 | 24.43 | 5.67 | -31.81 | |
| Control | Male | 57 | 56.42 | 3.23 | 59.19 | 3.15 | 2.77 | 0.49 |
| | Female | 31 | 55.61 | 2.8 | 57.81 | 2.75 | 2.15 | -0.89 |
| | Total | 88 | 56.14 | 3.13 | 58.7 | 3.07 | 2.56 | |
| Total | Male | 110 | 56.73 | 4.87 | 43.02 | 17.53 | -13.71 | 2.2 |
| | Female | 74 | 55.39 | 4.56 | 37.55 | 17.75 | -17.84 | -3.27 |
| | Total | 184 | 56.19 | 4.78 | 40.82 | 17.78 | -15.37 | |

Evidence from table 20 revealed that the male and female students in the training group had a lower mean difference of -31.44 and -32.28 respectively compared to the control group with respective mean differences of 2.77 for male and 2.15 for female. A further look at table20 shows that the male and female students in the experimental group reported a mean deviation of 1.19 and -1.48 respectively above and below the group mean of 24.43; while the male and female participants in control group recorded 0.49 and -0.89 respectively, above and below the group mean of 58.7 in there post-test AEMS. Generally, the experimental group exhibited

a negative attitude to examination malpractice while the control group displayed a positive attitude. A test of difference was done using 2x2 ANCOVA. The results are displayed in table 21.

Table 21: 2x2 ANCOVA of Effects of Gender and Experimental Conditions on Post Attitude to Examination Malpractice.

| Source | Type III Sum of Squares | Df | Mean Square | F | P- value. |
|-----------------|-------------------------------|-----|----------------|---------|--------------------|
| Corrected Model | 54204.1 | 4 | 13551 | 669.876 | .000* |
| Intercept | 1589.96 | 1 | 1589.96 | 78.598 | .000* |
| Covariate | 51.062 | 1 | 51.062 | 2.524 | .114 ^{ns} |
| Group | 50963.4 | 1 | 50963.4 | 2519.31 | .000* |
| Gender | 151.116 | 1 | 151.116 | 7.47 | .007* |
| Group *Gender | 14.826 | 1 | 14.826 | 0.733 | .393 ^{ns} |
| Error | 3621.01 | 179 | 20.229 | | |
| Total | 364429 | 184 | | | |
| Corrected Total | 57825.1 | 183 | | | |

*Significant at $p < 0.05$; Df= 1&179; Fcritical= 3.89; ns= not significant

Evidence from table 21 revealed that gender has a significant effect on post-test attitude to Examination malpractice with a calculated $F = 7.470$ (1,179), $p = 0.007 < 0.05$ level of significance. Table 21 further shows that there was no significant interaction effect between

gender and self-assessment training on students' post-test attitude to examination malpractice with a calculated $F = 0.733 (1,179)$, $p = 0.393 > 0.05$ level of significance. The null hypothesis was retained or accepted. This implies that male and female participants in the training and control groups did not significantly differ in post-test attitude to examination malpractice. It means that the self-assessment training did not discriminate between male and female participants and that however; the male students reported a slightly greater tendency to engage in examination malpractice than their female counterparts.

4.6 Discussion of Findings.

Hypothesis One states that there is no significant difference in the post-test Chemistry learning outcome scores of students who were exposed to the self-assessment training and those who were not. The result showed that a significant difference existed. Students who took part in the self-assessment training showed greater improvement in the Chemistry achievement test than their counterparts in the control group. Improvement in performance was achieved through the infusion of self-assessment skills into each chemistry topic taught. Each participant used the Chemistry rubric to self-assess when each topic was taught; so this made them conscious of their weaknesses and strengths. In the course of the lessons, the students worked on their weaknesses and built on their strengths and this resulted in better performance. Participants also received immediate feedback on the numerous class drills. This result is in conformity with a study by Sadler and Good (2006) on the Impact of Self-

and Peer- Grading on Student Learning which showed a very high correlation between student self-assigned grades and those of their teachers. Students who corrected their own test using the scoring rubric showed tremendous improvement in learning. They concluded that self-grading and peer-grading both saved the teacher's time, but most importantly, that self-grading resulted in increased student learning than peer-grading did (Sadler and Good, 2006).

Also, Miller (2012) studied the role of the nurse educator in self-assessment. He discovered that self-assessment was an important part of formative assessment and that it increased students' ability to self-regulate, self-critique and engage in life-long learning. In a similar study by Stallings and Tascione (1996), Student Self-assessment and Self-Evaluation were employed in teaching high school and college Mathematics and they engaged students in evaluating their progress. Their study revealed that the students developed communicative skills and it reflected on their understanding and ability to learn Mathematics. They confirmed that student self-assessment was extremely effective in enhancing students' confidence by affording many opportunities for students to learn and communicate about Mathematics. In the same vein, McDonald and Boud (2005) found positive achievement effects for self-assessment across different subject areas. Also in consonance with the above findings, students' self-assessment produced positive results for non-academic exercises, when grade 7 students were made to use a coding scheme to assess themselves, increased positive interactions and decreased off-task behaviour was observed (Ross, 1995). In his study on the effect of Peer and Self-assessment on male and female students' self-efficacy

and self-autonomy in the learning of Mathematics, Adediwura (2012) found that the use of peer and self-assessment enhanced students' self-efficacy and promoted learner autonomy in learning Mathematics.

Hypothesis Two states that the Chemistry post-test scores of the participants did not significantly differ between male and female students in the training and control groups. The study revealed that there was no significant gender difference in the Chemistry performance of the students. The interaction effect of gender and experimental conditions was also not statistically significant. Thus, suggesting that participants exposed to self-assessment training performed better regardless of their gender than their colleagues in the control group. The reason for this finding could be due to the fact that both male and female participants were equally exposed to the training. Hence, the effect of the training did not discriminate between the male and female participants. This supports findings from a similar study by Nbina and Viko (2010) where acquisition of metacognitive self-assessment skill resulted in better achievement of both male and female participants in the training group. On the contrary, in his study on the effect of instructional rubrics and guided self-assessment on students' writing and understanding of good writing, Andrade (2005) discovered that the rubric-referenced self-assessment had a positive effect on female students' writing but no effect on male writing. Similarly, Andrade and Boulay (2003) revealed that teaching grade 7-8 students how to make use of rubrics to assess themselves improved their writing performance even though the effects were limited to the female students for one of the two writing genres.

Adediwura (2012) however noticed that gender and peer/self-assessment did not significantly influence learners' autonomy in the study of Mathematics.

Hypothesis 3 states that there is no significant difference in participants' post-test self-assessment scores between the training and the control groups. Results from the study showed that there was a significant difference. It was observed that self-assessment skills acquired through the self-assessment training helped to improve the participants' achievement scores in Chemistry. This result is supported by the findings of Swartzlander, (2007) who discovered that teaching students to self-assess and keep track of their learning through the use of self-assessment rubrics on their homework helped them in doing their homework and understanding what they learnt. Also, in consonance with the findings of this research is a study in which Geeslin (2003) applied Student Self-Assessment in a Foreign Language class. Her study revealed that student self-assessment being a learner-centred strategy not only improved student outcomes but encouraged students to take responsibility for learner outcomes and to individualize the goals and tasks that they aimed to achieve. In agreement with the research findings, Ross, Hogaboam-Gray and Rolheiser (2002) declared that research evidence proved that self-assessment contributed to higher student achievement and improved behaviour.

Hypothesis Four states that there is no significant difference in participants' attitude to examination malpractice between the self-assessment training and control groups. The findings from this study showed that there was a significant difference in the students'

attitude to examination malpractice as a result of the self-assessment training. Participants who were exposed to the self-assessment training showed negative attitudes to examination misconduct than their colleagues in the control group. This could be attributed to the fact that the self-assessment skills acquired by the students enabled them to self-regulate, become confident, self-critique and work on their weak points in the course of the Chemistry lessons; hence there was no need to engage in examination malpractice. The participants became more confident and self-directed learners. In the opinion of the researcher, there was virtually no literature that related self-assessment to examination malpractice. However, Onakoya (2005) carried out a study on the influence of students' perception and attitude to cheating behaviour during examinations at a Christian based university. His findings revealed a significant negative relationship in which immoral students showed a negative attitude towards cheating. Also, the findings of Ossai (2011) showed that students with high examination anxiety were more predisposed to engage in examination malpractice because such students lacked concentration when studying and did not have sufficient knowledge of the course materials. Highly anxious students engaged in examination malpractice so as not to obtain poor academic results.

Hypothesis Five states that gender and experimental conditions have no significant interaction effect on participants' attitude to examination malpractice. The results of this study showed that gender and self-assessment training had no significant interaction effect on the students' attitude to examination malpractice. This implies that the self-assessment

training did not discriminate between male and female students but the male participants in this study showed a greater tendency to indulge in examination malpractice. This result is in contradiction with the findings of a study by Okorodudu (2013) which revealed that there was no significant relationship between students' gender and attitude to examination malpractice and that peer-pressure was the greatest predictor of students' attitude to examination malpractice. The results of this study contradict the findings by Ossai, 2011; when he concluded that both male and female students equally manifested greater tendencies of engaging in examination misconduct. In consonance, Athanason and Olasehinde (2002) did a meta-analysis of literatures that were related to the influence of gender on academic dishonesty and cheating and discovered that the male gender were more likely to cheat than their female counterpart. But when, Athanason and Olasehinde (2002) further analysed the results of literature reviewed, they reported that there was no significant difference in the proportion of male and female gender involved in cheating at examinations. However, Minesota State University (2006) asserted that out of the four recent studies which included gender as a possible explanatory variable for cheating, three studies reported that the male gender were more likely to cheat while one study did not find any significant correlation between gender and academic dishonesty. Also, found that there was no significant in pupils' Perception of examination malpractice by gender. This means that the students' perception of examination malpractice is independent of whether the pupil is a male or female. However, Good, Nichols and Sabers (1999) found that there was a significant difference in the

perception of cheating between male and female students. Hill (1972) also reported that girls cheated more frequently in some subjects like mathematics while boys cheated more in vocabulary tests. The contradictory findings of various researchers show that gender may or may not have an influence on students' attitude to examination malpractice but depended on the situation

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter is organised under the following sub-headings: Summary, Conclusion, Contributions to knowledge, Recommendations and Suggestions for further studies.

5.1 Summary of Research Findings

1. Findings from the study showed that students who were exposed to the self-assessment training recorded an improvement in their Chemistry learning outcome post test scores when compared with those who did not receive training.
2. The study revealed that there was no significant gender difference in the Chemistry learning outcome post test scores of the students. The interaction effect of gender and experimental conditions was also not statistically significant. Thus, suggesting that participants exposed to self-assessment training performed better regardless of their gender than their colleagues in the control group.
3. The results from the study also showed that there was a significant difference in the post test self-assessment scores of participants exposed to self-assessment training when compared with those who were not.

4. Findings from the study indicated that there was a significant difference in students' attitude to examination malpractice. The self-assessment training was effective in helping students develop a negative attitude to examination malpractice.

5. The study revealed that there was a significant gender difference in students' Attitude to Examination malpractice. The interaction effect of gender and experimental conditions was however, not statistically significant. This implies that male and female students in the training group showed a negative attitude to examination malpractice.

5.2 Conclusion

In the light of the preceding discussions, the following conclusions were drawn.

1. This study has confirmed that student self-assessment training actually improved the learning of Chemistry.
2. An effective student self-assessment training package which could be adapted for use in other subject areas has been produced through this research work.
3. Student self-assessment training has proven to be effective in curbing examination malpractice.

4. There was no significant interaction effect of gender and self-assessment training on students' attitude to examination malpractice.
5. There was no significant interaction effect of gender and student self-assessment on students' performance in post Chemistry achievement test (CAT).

5.3 Recommendations

In the light of the findings, the following recommendations were made:

1. Student self-assessment should be incorporated into the teaching and learning processes at the primary, secondary and tertiary levels since it has proven to equip the students with life-long learning skills which improved the performance of the students.
2. Curriculum planners should build student self-assessment into the school curricula of all subject areas and make it imperative for the teachers to practise it so that their lessons will become student-centred instead of teacher-centred. When a lesson is learner-centred, the students become active participants and no longer totally dependent on the teacher in the learning process. Such lessons will no longer be characterized by excess teacher talk, copying of notes and rote learning of textbook material which often inhibit students' interest.

3. Student self-assessment should be employed as means of curbing examination malpractice. This is because it equips the learner to become confident and to monitor his strengths and weaknesses as a result of which the learner is able to make-up on his shortcomings and perform better. A student who is conversant with the course material after undergoing self-assessment training need not engage in examination malpractice.
4. Parents should learn the techniques of self-assessment (since parents are also included in Vigotsky's concept of 'More knowledgeable other') so that they can apply it in assisting their children in learning at home.
5. The Ministry of Education should engage resource persons to train in-service teachers on techniques of student self-assessment so that teachers can practise it in the classroom to achieve instructional objectives and provide feedback to parents and students.
6. The government should include student self-assessment training in the curriculum of pre-service teachers in order to effectively equip them to handle students of different learning styles.

5.4 Contributions to knowledge

1. This study designed an easy-to-use (psycho-educational) students' self-assessment training package which could systematically be infused into any Chemistry lesson to achieve excellent student performance.
2. The researcher designed Conceptual framework which facilitates the understanding of linkages between self-assessment, learning outcome and examination malpractice - is a contribution to knowledge.
3. The research constructed instruments for measuring student self-assessment and attitude to examination malpractice.
4. The study demonstrated that students' self-assessment training is a cost effective method that can help students develop a negative attitude to examination malpractice. This is because a student who has acquired self-regulating and life-long learning skills, as a result of the training is not likely to engage in examination malpractice.
5. The study established that student self-assessment training was truly effective in improving the Learning outcome of Chemistry students in the Nigerian context.

6. The study contributed data and literature on the efficacy of self-assessment training in the Nigerian context and especially for Chemistry as a science subject.

5.5 Suggestions for Further Studies

The researcher hereby makes suggestions for further studies based on the research findings.

1. Future researchers should extend the research on student self-assessment to other subject areas in order to further prove its efficacy in the Nigerian setting.
2. It is suggested that the research should be carried out in a wider geographical region to allow for better generalizability.
3. This research work could be replicated using private schools so that the findings could be compared with that of public schools.
4. Other researchers could carry out this study using other aspects of Chemistry since this particular study was done with Organic Chemistry, being the topic in the schools' 2014/2015 session, Third Term Scheme of work for SS II.

5.Educational organisations and programmes should be made to conduct self-assessment periodically to ascertain their effectiveness.

REFERENCES

- Absolum, M., Flockton, L., Hattie, J. & Hipkins, R. (2009). Directions for assessment in New Zealand. Retrieved from <http://www.tki.org.nz/r/assessment/pdf/danz.pdf>
- Adediwura, A.A. (2012). Effect of peer and self-assessment on male and female students' self-efficacy and self-autonomy in the learning of Mathematics. *Gender and Behaviour*, 10(1), 74-89.
- Aderogba, A.A. & Olatoye, R.A. (2012). Do religiously committed students engage in less examination malpractice behaviours? *International Journal for Social Sciences and Education*, 3(8), 23-34.
- Ahola, A.S., Christianson, S.A., Hellstrom, A. (2009). Justice needs a blindfold: effects of gender and attractiveness on prison sentences and attributions of personal characteristics in a judicial process. *Psychiatry Psychology Law* 16(Supplement):S90–S100.
- Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behaviour*. New York: Springer-Verlag.

Alade, O. M. (2007). Teacher attitude to inspectors and inspection: Quality control.

International Journal of Educational Research, 3(2), 203-215.

Alonge, M. F., Adebule, S. O., & Osundare, A. G. (2015). Gender Analysis of Students Performances in Matching and Completion Test Formats; A Chemistry Achievement Test. *Journal of Educational Policy and Entrepreneurial Research*, 1(4), 87-91.

Alpert, M. (2002). *Self-assessment methods*. Portland: Portland State University Press.

Ameen, E.C., Guffey, D.M, & McMillan, J.J. (1996). Gender differences in determining the ethical sensitivity of future accounting professionals. *Journal of Business Ethics* 15(5), 591–597.

Andrade, H. G. (2005). Teaching with rubrics: The good, the bad, and the ugly. *College teaching*, 53(1), 27-31.

Andrade, H. G., & Boulay, B. A. (2003). Role of rubric-referenced self-assessment in learning to write. *The Journal of Educational Research*, 97(1), 21-30.

Anorve, R. F. (2010). Extraordinary teachers, exceptional students. *Phi Delta Kappan*, 92(2), 46-50.

Anzene, J.S. (2014). Trends in examination malpractice in Nigerian system and its effects on

thesocio-economic and political development of Nigeria. *Asian Journal of Humanities and Social sciences*. 2(3),1-8.

Amelink, C. (2009). Gender Differences in Science Performance: Assessing women and men in engineering. SWE-AWE-CASEE ARP Resources.Retrieved from <http://www.AWEonline.org>.

Apanpa, O.S. &Ogunbiyi, O. (2012). Learning and teaching styles in Language, Science and technology education in Nigeria. *British Journal of Arts and Social Sciences*.5(2), 155-165.

Athanason, J. A., &Olasehinde, O. (2002). Male and female differences in self-report cheating.Practical Assessment, Research & Evaluation, 8(5). Retrieved from <http://PARE online.net/getrn. Asp? V=8 & n=5>

Atabong, T. A., Okpala, M. C., Abondem, A. L. &Essombe, C. E. (2010). Eliminating examination malpractice in Africa with automated test taking, marking and result printing. *Tropical Journal of Biomedical and Allied Sciences Research*, 4(1), 452-469.

Babatunde, A. (2010). Teacher-related variables as correlates of pupils' performance in social studies in South western, Nigeria. *Electronic journal of research in Educational Psychology*, 8(3), 313-332.

- Badmus, G. A. (2006). "Accountability in teaching/learning environment and examination malpractices". A speech delivered at two-day summit on examination malpractice in Nigeria organized by the House of Representatives Committee on education held at the ShehuYar'Adua Centre, Abuja, August 15-16, 2006.
- Bandura, A. (1977). *Social learning theory*. New Jersey: Prentice Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.
- Bandura, A. (1986). *Social foundations of thoughts and action: A social cognitive theory*. Eaglewood Cliffs, N J: Prentice-Hall.
- Berry, B. (2003). *What it means to be a "highly qualified teacher"*. Chapel Hill, NC: Southeast Centre for Teaching Quality. Retrieved from <http://www.teachingquality.org/resources/pdfs/definingHQ.pdf>
- Black, P. & William, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, 80(2), 139-148.
- Bolin, A,U. (2004). Self-control, perceived opportunity, and attitudes as predictors of academic dishonesty. *Journal of Psychology*. 138, 101–114.
- Borden, V., & Zak Owens, J. L. (2001). Measuring quality: Choosing among surveys and other assessment of college quality. Washington, DC: American Council on Education and Florida State University.

- Boud, D. (2003). *Enhancing learning through self-assessment*. London: RoutledgeFalmer.
- Bowers, W.J. (1964). *Student dishonesty and its control in colleges*. New York: Bureau of applied social research, Columbia University.
- Brimble, M. & Stevenson-Clarke, P. (2005). Perceptions of the prevalence and seriousness of academic dishonesty in Australian universities. *Australian Education Research*. 32, 19–44.
- Bushway, A. & Nash, W.R. (1977). School Cheating Behaviour. *Review of Educational Research*, 47(4), 623 -632.
- Carlo, M. & Josefine, S. (2006). The Role of teacher efficacy and characteristics on teaching effectiveness, performance and use of learner-centered practices. *The Asia Pacific Education Researcher*. 26(1), 35-49.
- Centre for Academic Integrity. (2005). Center for Academic Integrity. Retrieved from <http://www.academicintegrity.org>.
- Conway, J.M., Hard, S.F. & Moran, A.C. (2006). Faculty and college student beliefs about the frequency of student academic misconduct. *Journal of Higher Education*, 77, 1058–1080.
- Colnerud, G. & Rosander, M. (2009). Academic dishonesty, ethical norms and learning. *Assessment & Evaluation in Higher Education*, 34(5), 505-517.

- Cornelius-Ukpepi, B. U. & Enufoha, O.I. (2012). A perception of examination malpractice and pupil's academic performance in primary science in Cross River State, Nigeria. *Journal of Education and Learning*, 1(2), 21-31.
- Cruikshank, D. R., Jenkins, D. B., & Metcalf, K.K. (2003). *The Act of teaching*. New York: McGraw-Hill.
- Darling-Hammond, L. (1983). *Teacher quality and student achievement*. Washington, DC: American Educational Research Association. Retrieved from: www.eric.ed.gov/ERICportal/recordDetail?accno..
- Deakin-Crick, R. Sebba, J. Harlen, W., Yu, G. & Lawson, H. (2005). Systematic review of research-evidence of impact on students of self- and peer assessment. *Protocol in: Research evidence in education library*. London: EPPI-Centre, Social Science Research unit, Institute of Education, University of London.
- Dindyal, M. (2005). *Assessment, evaluation and reporting*. Toronto: Toronto District school Board.
- Egbochuku, E. O., Ekoja, A. A. & Ekoja, C. O. (1999). Student self-assessment in a new testing system in Nigeria as an alternative solution to assessment problem. *Teacher Education: A journal of the Association of Teacher Educators of Nigeria*, 1 (2), 117-123.

- Ehrenberg, R.G. & Brewer, D. J. (1994). *Do school and teacher characteristics matter? Evidence from high school and beyond*. New York: Cornell University Press.
- Eriksson, L. & McGee, T.R. (2015). Academic dishonesty amongst Australian criminal justice and policing university students: individual and contextual factors, *International Journal for Educational Integrity*, 11(5), 1-70.
- Farrington, D.P. (2005). The Integrated Cognitive Antisocial Potential (ICAP) theory. In: Farrington DP (Ed.), *Integrated developmental and life-course theories of offending*, 14, 73–92. New Brunswick, NJ: Transaction Publishers.
- Federal Republic of Nigeria (2013). *National Policy on Education*. Lagos: Nigerian Educational Research and Development Council.
- Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention, and behaviour: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Galloway, C.M. (2001). Vygotsky's Constructivism. In M. Orey (Ed.), *Emerging perspectives on learning, teaching, and technology*. Retrieved from <http://projects.coe.uga.edu/epltt/>
- Geeslin, K. L. (2003). "Student self-assessment in the foreign language classroom: The place of authentic assessment instruments in the Spanish language classroom" *Hispania*, 86(4), 857-868.

- Gibson, C.L., Khey, D.&Schreck, C.J. (2008). Gender, Internal control, and Academic dishonesty: Investigating mediating and differential effects. *Journal of Criminal Justice Education*, 19(1), 2–18.
- Good, T. L., Nichols, S. L. & Sabers, D. L. (1999). Understanding youths commitment to schools and toward a more differentiated view. *Social Psychology of Education*, 3, 1-39.<http://dx.doi.org/10.1023/A:1009653321435>
- Gunawardena, E. (2010). “A Rubric to self-assess and peer-assess mathematical problem solving tasks of college students”. *Acta Didactica Napocensia*, 3(1), 75-88.
- Hill, K. T. (1972). Anxiety in an evaluative content. In W. W. Hartup (Ed.), *The young child* 2, 37-40. Washington D.C: National Association for Education of the young.
- Hudson, R.D. (2012). Gender differences in Chemistry performance: What is the relationship between gender, question type and question content? International conference on the future of education 2nd edition. Australian Council for Educational Research: Australia.
- Hrabak ,M., Vujaklija, A., Vodopivec, I., Hren, D., Marusic, M. & Marusic, A. (2004). Academic misconduct among medical students in a post-communist country. *Medical Education*, 38, 276–285.
- Ilogu, G.C. & Adebisi, A.A. (2004). Cognitive style, study habit and instructional strategies:

- Their comparative effects on student learning outcomes in Chemistry. *Lagos Journal of Educational Research*, 2(1), 30-41.
- Ilogu, G.C. (2005). *Educational research and evaluation*. Lagos: Raytel Communications.
- Imhanlahimi. E. O. & Aguele, L.I. (2006). Three instruments for assessing Biology teacher's effectiveness in the instructional process in Edo State, Nigeria. *Journal of Social Science*, 13(1), 67-70.
- Isichei, F.M. & Ubangha, M.B. (2004). Attitude of undergraduate education students towards the study of Philosophy of education: Implications for teachers' preparation. *Lagos Journal of Educational Research*, 2(1), 74- 85.
- Jacob, B. A. & Levitt, S.D. (2003). *Catching Cheating Teachers: The Results of an Unusual Experiment in Implementing Theory*. USA: Brookings-Wharton Papers on Urban Affairs Publications.
- Jensen, L.A., Arnett, J.J., Feldman, S.S. & Cauffman, E. (2002) It's wrong, but everybody does it: academic dishonesty among high school and college students. *Contemporary Educational Psychology*, 27, 209–228.
- Jimoh, B.A. (2009). Examination malpractice in secondary schools in Nigeria: What sustains it? *European Journal of Educational studies*, 1(3), 10.
- Joshua, M.T., Ekpoh. U.I., Edet, .A.O., Joshua, A.M. & Obo, F.E. (2010). *Managing*

examination crisis: The menace of examination malpractice in Nigeria. A paper presented at a Capacity Building Workshop for Science and English Teachers in AkwaIbom State, Nigeria.

Joshua, M. T. (2008). Examination malpractice: The monster in our midst. A Paper presented at capacity Building Workshops for Science and English Language teachers in AkwaIbom State, Nigeria, in August.

Joyce, C., Spiller, L. & Twist, J. (2009). *Self-Assessment: What teacher's think*. New Zealand: New Zealand Council for Educational Research. Retrieved from <http://www.nzcer.org.nz/pdfs/self-assessment.pdf> 12/12/2011.

Kano, T. N. (2004). Gender Education and Human Resource Development. *Journal of Curriculum Organization of Nigeria*, 11(1), 29-33.

Kremmer, M.L.,Brimble, M. & Stevenson-Clarke, P. (2007). Investigating the probability of student cheating: the relevance of student characteristics, assessment items, perceptions of prevalence and history of engagement. *International Journal of Education Integrity*, 3, 3–17.

Khalid, A. (2015). *Comparison of academic misconduct across disciplines – Faculty and student perspectives*. Southern Polytechnic State University, USA: Horizon Research Publishing.

- Kpangban, E., Ajaja, O.P., & Umudhe, S. E. (2008). Moral values and development of right attitude as a panacea to examination malpractice in Nigeria. *Journal of Social Science*, 17 (3), 223-231.
- LaBeff, E.E. (1990). Situational ethics and college student cheating. *Sociological Inquiry*, 60(2), 192.
- Lambert EG, & Hogan, N.L. (2004). Academic dishonesty among criminal justice majors: a research note. *American Journal of Criminal Justice*, 29, 1–22.
- Leming, J.S. (1980). Cheating behaviour, subject variables, and components of the internal-external scale under high and Low-risk conditions. *Journal of Educational Research*, 74(2), 83–87.
- Maheshwari, V.K. (2011). *Malpractices in examinations- The termites destroying the educational set-up*. India: K.L.D.A.V (P.G) College, Roorke. Retrieved from <http://www.Vkmaheshwari.com/wp/?author=1>
- Marshall, S. & Garry, M. (2006). NESB and ESB students' attitudes and perceptions of plagiarism. *International Journal of Educational Integrity*, 2, 26–37.
- McCabe, D. L., & Trevino, L.K. (1997). Individual and contextual influences on academic dishonesty: A multi-campus investigation. *Research in Higher Education*, 38(2), 380.

- McDonald, B. & Boud, D. (2005). The impact of self-assessment on achievement: The effects of self-assessment training on performance in external examinations. *Assessment in education*, 10(2), 29-220.
- McDonald, B. (2013). Mentoring and tutoring your students through self-assessment. *Innovations in Education and Teaching International*, 50(1), 62-71.
- McCabe, D.L., & Trevino, L.K. (1993). Academic dishonesty: honour codes and other contextual influences. *Journal of Higher Education*, 64, 522–538.
- McCabe, D.L., & Trevino, L.K. (1996). What we know about cheating in college: longitudinal trends and recent developments. *Change*, 28, 29–33.
- Miller, B. (2012). *Student Learning: The role of self-assessment*. Sophia: Saint Catherine University.
- Minesota State University (2006). Academic dishonesty article. Retrieved from <http://www.musu.edu/cetl/teachingresources/articles/academicdishonesty.html>
- Ministry of Education (2007). *The New Zealand Curriculum*. Wellington: Learning Media.
- Ministry of Education. (2006). A guide to effective literacy instruction: Assessment. Toronto, ON: Queen's Printer for Ontario.
- Ministry of Education (2002). The Ontario Curriculum unit planner. Toronto, ON: Queen's

Printer for Ontario.

National Research Council. (2006). To Recruit and Advance: Women Students and Faculty in Science and Engineering. Retrieved from <http://www.nap.edu/catalog.php?record>

Nbina, J.B. &Viko, B. (2010). Effect of metacognitive self-assessment strategy on Chemistry self-efficacy and achievement of senior secondary school students in Rivers State Nigeria.*Academic Leadership*,8(4), 71-85.

Nicol, D. (2007). Principles of good assessment and feedback: Theory and practice. The REAP International Online Conference on Assessment Design for Learner Responsibility, 29th-31st May, 2007. Retrieved from <http://ewds.strath.ac.uk/REAP07>.

Nonis, S. & Swift, C.O. (2001). An examination of the relationship between academic dishonesty and workplace dishonesty: a multi-campus investigation. *Journal of Education and Business*, 77,69–71.

Nwokora, B. I. (2010). *Assessment of the implementation of Government measure for controlling examination malpractices in Ebonyi State secondary schools*. Nsukka: University of Nigeria, Nsukka.

Obashoro-John, O. (2011). Characteristics of an effective teacher: Implications for adult educator.

Online:http://www.researchgate.net/publication.net/242052950_characteristics

Odesina, I.A. (2008). *Essential chemistry for senior secondary schools*. Ogun State: Tonad Publishers.

Okon, R. O. (2005): Mathematics Achievement and Academic Performance in Chemistry. *Journal of Quality Education*, 2(1), 11-25.

Okoli, C.E. (2005). *Introduction to educational and psychological measurement*. Lagos: Behem Press and Publishers.

Okorodudu, G.N. (2013). Peer pressure and socioeconomic status as predictors of students' attitude to examination malpractice in Nigeria. *International Journal of Education*, 5(1), 36-51.

Olasumbo, S. A. & Ogunbiyi, O. (2012). Learning and teaching styles in language, science and technology education in Nigeria. *British Journal of Arts and Social Sciences*, 5(2), 46-60.

Onakoya, A. Y. (2005). The influence of students' perception and attitude on cheating behaviour in examination at a Christian based University. *A paper presented at the 5th National Conference of Nigeria society for educational psychologists*. Abuja: University of Abuja.

Onu, A. D. (2007). The need to reposition SSCE Chemistry practical skills for National

development and technological breakthrough. *Zaria Journal of Educational Studies*, 9(1), 151-158.

Onyechere, J. (2006). Examination *Ethics handbook: An examination ethics project*. Lagos: Protomac Books limited.

Onyibe, C.O., Uma, U.U. & Ibina, E. (2015). Examination Malpractice in Nigeria: Causes and Effects on National Development. *Journal of Education and Practice*, 6(26), 12-17.

O'Rourke, J., Barnes, J., Deaton, A., Fulks, K., Ryan, K. & Rettinger, D.A. (2010). Imitation is the sincerest form of cheating: the influence of direct knowledge and attitudes on academic dishonesty, *Ethics Behaviour*, 20, 47–64.

Orsmond, P. (2004). *Self and peer assessment: Guidance and Practice in the Biosciences*. Leeds, Great Britain: Centre for Bioscience, the Higher Education Academy.

Osei, Y, A. (2010). *New School Chemistry for Senior Secondary Schools*. Onitsha: Africana First Publishers.

Ossai, C.M. (2011). Students' attitude toward examination malpractice. Department of Educational Psychology, Delta State University: *International Association for teaching, Learning and Change* (IATEL). Accessed from www.hrmars.com/admin/pics/115.pdf

Oyinbe, O.C, Uma, U.U & Ibina, E. (2015). Examination malpractice in Nigeria: Causes and

effects on national development. *Journal of education and practice*, 6(26) 12-17.

Parker, P.E., Flemming, P.D., Bayerleins Apple, D. & Krumsieg, K. (2001). Differentiating assessment from evaluation as continuous improvement tools: 31st ASEE/FEEE Frontiers in Education Conference. Reno, Nv.

Patrzek, J., Sattler, S., van Veen, F., Grunschel, C. & Fries, S. (2014). Investigating the effect of academic procrastination on the frequency and variety of academic misconduct: a panel study. *Studies in Higher Education*: 1–16. doi:10.1080/03075079.2013.854765.

Piaget, J. (1977). *The development of thought: Equilibration of cognitive structures*. Oxford England: Viking.

Pope, J., Writer Sat, A.E., Nine, M.B.A. & Jones, M. (2007). *Higher education sees rise in dishonesty*. May: Associated Press.

Rice, J. K. (2003). *Teacher quality: Understanding the effectiveness of teacher attributes*. Washington, D.C.: Economic Policy Institute.

Research Methods Knowledge Base (2006). Retrieved from <https://archive.org/details/williamTrochimJamesPDonnellyTheResearchMethodsKnowledgeBase2006>

Rolheiser, C. & Ross, J. A., (2001). Student self-evaluation: What research says and what practice shows. Retrieved from http://www.cdl.org/resource-library/articles/self_eval.php

Rolheiser, C. & Ross, J. A., (1999). Student self-evaluation: What research says and what practice shows. Canada: University of Toronto. Retrieved from www.cdl.org/resource-library/articles/self_eval.php

Ross, J.A. (1995). Effects of feedback on student behaviour in cooperative learning groups in a grade 7 math class. *Elementary school Journal*, 96(2), 125-143.

Ross, J. A. (2006). The reliability, validity, and utility of self-assessment. *Practical Assessment Research & Evaluation*, 11(10), 1-13.

Ross, J.A., Hogaboam-Gray, A. & Rolheiser, C. (2002a). Student Self- evaluation in grade 11 mathematics: Effects on achievement and student beliefs about ability. In D. McDougall (Ed.), *OISE Papers on Mathematical Education*. Toronto: University of Toronto.

Ross, J.A., Hogaboam-Gray, A., & Rolheiser, C. (2002b). Student self-evaluation in grade 5-6 mathematics: Effects on problem solving achievement. *Educational Assessment*, 8(1) 43-58.

Ross, J.A. & Starling, M. (2005, April). *Achievement and self-efficacy effects of self-evaluation training in a computer-supported learning environment*. Paper presented at the annual meeting of the American Educational Research Association, Montreal.

- Sadler, P.M. & Good, E. (2006). Impact of peer- and self- grading on student learning. *Educational Assessment, 11*(1), 1-31.
- Salter, S.B., Guffey, D.M. & McMillan, J.J. (2001). Truth, consequences and culture: a comparative examination of cheating and attitudes about cheating among U.S. and U.K. students. *Journal of Business Ethics, 31*, 37–50.
- Simmons, S.C. (1999). "Competing Notions of Authorship: A Historical Look at Students and Textbooks on Plagiarism and Cheating". In Lise Buranen, Alice M. Roy. *Perspectives on Plagiarism and Intellectual Property in the Postmodern World*. Albany: State University of New York Press. p. 42. ISBN 978-0791440803.
- Smith, K.J., Davy, J.A., & Easterling, D. (2004). An Examination of cheating and its antecedents among marketing and management majors. *The Journal of Business Ethics, 50* (10), 66.
- Spearman, C. (1904). General intelligence: Objectively determined and measured. *American Journal of psychology, 15*, 201-293.
- Ssempala, F. (2005). Gender differences in the performance of Chemistry practical skills among senior six students in Kampala District. Florida, USA: Dissertation.com Boca Raton.
- Stallings, V. & Tascione, C. (1996). Student self-assessment and self- evaluation. *Mathematics Teacher, 89*, 548-554.

Swartzlander, D. (2007). *Effects of self-assessment on Math Homework*. (Unpublished thesis). Lincoln: University of Nebraska.

The West African Examinations Council Annual Report (2001-2015).

The West African Examinations Council (2008): *WAEC Chief Examiner's Report*.

Thea, T.E. (2008). *About self-assessment for students*. New Orleans: Tulane University.

Thompson, S., Greer, J. & Greer, B. (2004). *Highly qualified for successful teaching: Characteristics every teacher should possess*. Tennessee: University of Memphis.

Tibbetts, S.G. (1998). Differences between criminal justice majors and noncriminal justice majors in determinants of test cheating intentions. *Journal of Criminal Justice Education*, 9, 81–94.

Tonarely, K. (2008). *The advantages of a classroom self-assessment*. Springfield: Evangel University.

Transparency International (2014). Corruption perception index 2014. Transparency International: Berlin.

Trochim, W.M.K. (2006). *Research methods knowledge base*. Retrieved from <http://www.socialresearchmethods.net/kb/order.php>

- Udousoro, U. J.(2011).The Effects of Gender and Mathematics Ability on Academic Performance of Students in Chemistry.*An International Multidisciplinary Journal*, 5 (4), 201-213.
- Uduh, C. A.O. (2009a). Managing examination crisis in Nigeria: The WAEC Experience. A paper delivered at the 27th Annual Conference for Educational Assessment in Cameroun.
- Uduh, C.A.O. (2009b). Managing Examination Malpractice in Nigeria: The West African examinations Council (WAEC) Experience. Research Department, WAEC, Lagos, Nigeria.
- Vygotsky, L., S. (1978). *Mind in society: Development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Wan, T.Y., Chapman, D.W. &Biggs, D, A. (1992). Academic stress of international students attending U.S. universities. *Research in Higher Education*, 33, 607–623.
- Wayne, A. M. &Youngs, P. (2003). Teacher characteristics and student achievement gains: *A Review of Educational Research*, 73(1), 89-122.
- West, T., Ravenscroft, S. &Shrader, C. (2004). Cheating and moral Judgment in the college classroom: A Natural Experiment. *Journal of Business Ethic*, 54(2), 181.

Whitley, B.E., Nelson, A.B. & Jones, C.J. (1999). Gender differences in cheating attitudes and classroom cheating behaviour: a meta-analysis. *Sex Roles*, 41, 657–680.

Williams, S., Tanner, M., Beard, J. & Chacko, J. (2014). Academic misconduct among business students: A Comparison of the US and UAE. *Journal of Academic Ethics*, 12, (1), 65–73.

Witmer, H. & Johansson, J. (2015). Disciplinary action for academic dishonesty: does the student's gender matter? *International Journal for Educational Integrity*. doi: 10.1007/s40979-015-0006-2

Yara, P. O. (2009). Relationship between teacher's attitude and students' academic achievement in Mathematics. *European Journal of Social Sciences*, 11 (3), 364-369.

Zimmerman, B. (2001). Theories of self-regulated learning and academic achievement: An overview and analysis. In B. Zimmerman & D. Schunk. (Eds.) *Self-regulated learning and academic achievement: theoretical perspectives (2nd ed.)*. New Jersey: Lawrence Erlbaum Associates.

APPENDIX: 1

Sample Chemistry Self-assessment Rubric or scoring guide

| Scoring criteria | Performance standards: | | | | Strengths/ weaknesses |
|--|---|--|---|---|--------------------------|
| | 4 | 3 | 2 | 1 | |
| Conceptual understanding and connections | Used chemistry terms correctly and showed a complete understanding of how they connect. | Used most chemistry terms correctly and showed an understanding of their connections | Showed some understanding of chemistry terms and their connections. | No conceptual understanding. Found almost no important chemistry term. | |
| Strategies and reasoning | Displayed all the steps used to solve the problem. | Displayed a reasonable plan and most of the steps used to solve the problem. | Showed some steps but plan was not clear. | Showed no plan or a plan that was not reasonable. | |
| Computation or calculation. | Computed with no mistakes. | Minor errors in calculation. | Major errors in calculation and arrived at wrong answer. | No calculation or computations were wrong, but attempted some or all of them. | |
| Communication | Completely communicated what was done and why it was done. | Communicated mostly what was done and a little about why it was done. | Communicated something and why it was done but not both. | No written explanation or communicated something | |

| | | | | | |
|--|--|--|--|----------------------------------|--|
| | | | | that did not go with the answer. | |
|--|--|--|--|----------------------------------|--|

Source: adapted from Gunawardena, 2010.

APPENDIX: 2

Chemistry Rubric score sheet

| TOPICS | Conceptual understanding/ Connections. | Strategies/ reasoning | Computation/ calculation | Communication | Total / 16 |
|--|---|--------------------------|-----------------------------|---------------|------------|
| Introduction to organic Chemistry | ----- | ----- | ----- | ----- | |
| Saturated and unsaturated hydrocarbons | ----- | ----- | ----- | ----- | |
| Aromatic Hydrocarbons | ----- | ----- | ----- | ----- | |
| Alkanols/petroleum | ----- | ----- | ----- | ----- | |

APPENDIX: 3

Chemistry self-assessment future plan schedule

Goal- what do I want to learn? -----

Location- Right now I can do-----

Plan- My goal is to get----- before the next----- I need to
improve in/on-----

Action—I will start in----- I will use this strategy to-----

Results----Did I follow through with my plan? What happened? Any improvement?

Adapted from: Gunawardena, 2010.

University of Lagos

School of Post Graduate Studies

Department of Educational Foundations (with Educational Psychology)

CHEMISTRY STUDENTS' QUESTIONNAIRE (SSASC).

Dear student, this is not an examination. The purpose of this questionnaire is to ascertain the extent to which students of chemistry are able to apply the knowledge of self-assessment skills and techniques to the learning and solving of Chemistry questions. Your responses will not only be treated as confidential but appreciated.

INSTRUCTION: This questionnaire consists of sections A and B. Please rate each statement in terms of how closely you agree or disagree with the statement expressed. Use the following scale and record your answer in the space provided to the left of each statement. Use a tick (✓).

S.A= Strongly Agree

A= Agree

D=Disagree

S.D= Strongly Disagree

SECTION A: PERSONAL DATA

- 1. My Gender: Male()Female()**
- 2. My Class: SS.II**
- 3. My Age:_____**
- 4. School Type: Public**
- 5. Subject: Chemistry**

SECTION B: STUDENT SELF-ASSESSMENT SCALE IN CHEMISTRY (SSASC).

| S/N | ITEMS | SA | A | D | SD |
|-----|--|----|---|---|----|
| 1 | Marking my own chemistry exercises using the marking criteria makes me learn more. | | | | |
| 2 | Grading my own work using the chemistry marking guide enables me to think well. | | | | |
| 3 | Student self-assessment increases my confidence in chemistry learning. | | | | |
| 4 | Marking my own chemistry assignment using the marking guide makes me discover my strengths. | | | | |
| 5 | Student self-assessment makes me an independent learner. | | | | |
| 6 | Scoring my work using the chemistry marking guide helps me to critique my answers. | | | | |
| 7 | Student self-assessment prepares me for life-long on-going journey of learning | | | | |
| 8 | Student self-assessment helps me to construct (or form) my own learning. | | | | |
| 9 | Self-assessment is easy. | | | | |
| 10 | Self-assessment training has improved my chemistry performance. | | | | |
| 11 | I participate actively in chemistry classes due to self-assessment training. | | | | |
| 12 | Self-assessment training makes me unbiased when grading my own work. | | | | |
| 13 | Self-assessment training helps me to develop an intense (deep) approach to learning chemistry. | | | | |
| 14 | Self-assessment training has empowered me to be personally responsible for my own learning. | | | | |
| 15 | I can solve more mathematical problems in chemistry following the scoring guide. | | | | |
| 16 | Self-assessment training is student-centred. | | | | |
| 17 | I feel better informed about the learning of chemistry due to self-assessment training. | | | | |
| 18 | Drawing-up chemistry marking guide for self-assessment encourages discussion between my tutor and I. | | | | |
| 19 | Marking my own chemistry tasks using the scoring guide reduces my anxiety about teacher grading. | | | | |

| | | | | | |
|----|--|--|--|--|--|
| 20 | Student self-assessment enables me to review my weak areas in chemistry. | | | | |
|----|--|--|--|--|--|

| | STUDENTS' ATTITUDE TO EXAMINATION MALPRACTICE | SA | A | D | SD |
|----|---|-----------|----------|----------|-----------|
| 1 | I feel very guilty cheating during examinations. | | | | |
| 2 | If I do not cheat, those who do will score higher marks than I. | | | | |
| 3 | I engage in exam malpractice due to lack of confidence in myself. | | | | |
| 4 | I cheat because am too busy to study for examinations. | | | | |
| 5 | No matter how hard I study for examinations, I will fail if I do not cheat. | | | | |
| 6 | I like my school because it encourages cheating. | | | | |
| 7 | I cheat because I am afraid during examinations. | | | | |
| 8 | I see nothing wrong with cheating during examinations. | | | | |
| 9 | A good school should not allow students to cheat during examinations. | | | | |
| 10 | You need to cheat in examinations to come out tops. | | | | |
| 11 | Dishonest students cheat in order to earn good grades. | | | | |
| 12 | I like it when invigilation is not effective. | | | | |
| 13 | I like writing examinations for others because it is a clever means of making pocket money. | | | | |
| 14 | I love to cheat during examinations. | | | | |
| 15 | I like bribing invigilators to allow cheating during examinations. | | | | |
| 16 | I love people who impersonate to write examinations for others. | | | | |

CHEMISTRY ACHIEVEMENT TEST

NAME:

CLASS: SS II

DURATION: 1½ hours.

INSTRUCTION: Your responses will be treated as confidential since this is purely for research. Attempt all the questions in parts A and B.

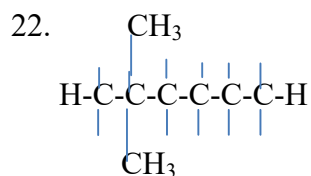
PART A

1. The following are general characteristics of Carbon except
 - (a) covalent nature
 - (b) low melting and low boiling point
 - (c) low reactivity with other elements except oxygen and the halogen
 - (d) hydrogen bond in petrol
 - (e) high reactivity with salts.
2. The exceptionally large number of carbon compounds is essentially due to the ability of
 - (a) carbon to catenate liberally
 - (b) various groups to catenate
 - (c) nitrogen, hydrogen phosphorous and the halogens to catenate with themselves.
 - (d) hydrocarbons to dominate other groups
 - (e) carbon to multiply with the halogens.
3. The name of $C(CH_3)_4$ is
 - (a) butane
 - (b) tetramethyl butane
 - (c) methyl propane
 - (d) methyl propane
 - (e) 2-dimethyl propane
4. Functional groups in organic compounds
 - (a) determine the chemical properties of homologous series
 - (b) does not modify the order when they are more than one in a molecule
 - (c) have general formula which may include the functional group
 - (d) are responsible for the physical properties
 - (e) are irreplaceable.

5. Homologous series with the general formula $R-\overset{\text{NH}_2}{\underset{|}{\text{C}}}=\text{O}$ is
- an amine
 - amino acids
 - oxy-amines
 - amides
 - ammonia.
6. The name of $\text{CH}_3(\text{CH}_2)_2\text{CONH}_2$ is
- methyl amine
 - butyl amine
 - butanamide
 - urea
 - propyl amide.
7. The name of $\text{Cl}-\text{CH}_2-\text{CH}_2-\text{CH}_2\text{OH}$ is
- chloropropan-3-ol
 - 3-chloropropane-1-ol
 - 1-chloropropanol
 - 3-chloropropanol
 - 4-chloropropan-2-ol.
8. Two or more compounds obtained from $\text{C}_2\text{H}_6\text{O}$ by making adjustment to their molecule is
- allotropy
 - tautomerism
 - mirror isomerism
 - structural isomerism
 - partial isomerism.
9. The name of
- is:
- Benzene
 - hexane
 - cyclo hexane
 - hydro- hexane
 - cyclo-hydroxyl.
10. The main natural sources of hydrocarbons are from fossil fuels and these include the following, except one
- natural gas
 - coke
 - coal
 - petroleum

- (e) water.
11. Petrol provides
- (a) fuels only
 - (b) fuels and money
 - (c) fuels and pollutants
 - (d) fuels and petrochemical raw materials
 - (e) fuels and liquid gold.
12. Functional group for the alkanols is
- (a) $C_nH_{2n+1}OH$
 - (b) C_nH_{2n-2}
 - (c) carboxylic group
 - (d) hydroxyl group
 - (e) amine group.
13. Alkenes and Alkynes react the same except with
- (a) ammoniacal $AgNO_3$ solution
 - (b) Oxygen
 - (c) Bromine water
 - (d) acidified $KMnO_4$ solution
 - (e) conc. $NaCl$.
14. Primary alkanols are oxidized to carboxylic acids, secondary alkanols are oxidized to alkanones while tertiary alkanols are
- (a) oxidized to mixture of alkanals
 - (b) oxidized to mixture of alkanones
 - (c) oxidized to alkoxides
 - (d) not oxidized
 - (e) halogen oxidized.
15. Which of these compounds exhibits resonance?
- (a) ethanol
 - (b) ethane
 - (c) benzene
 - (d) butyne
 - (e) propylene
16. The solubility of alkanols in water is due to their
- (a) covalent nature
 - (b) hydrogen bonding
 - (c) low boiling points
 - (d) low freezing points
 - (e) ionic character

17. Which of this is an aromatic hydrocarbon?
- cyclopentane
 - ethane
 - Toluene
 - pentanal
 - methylamine
18. A characteristic of the alkane family is the ----- reaction.
- addition
 - elimination
 - neutralization
 - substitution
 - exothermic.
19. The alkyl group is represented by the general formular
- C_nH_{2n}
 - C_nH_{2n+1}
 - C_nH_{2n+2}
 - C_nH_{2n-2}
 - C_nH-2 .
20. An isomer of C_5H_{12} is
- 2-methylbutane
 - 2-ethylbutane
 - 2-methylpentane
 - 2-methylpropane.
 - 2-propylpentane.
21. Cyclohexane and benzene have an equal number of
- carbon atoms
 - double bonds
 - hydrogen atoms
 - single bonds
 - triple bond.



The IUPAC nomenclature of the compound above is

- (a) 2-dimethyl hexane
- (b) 2-ethylhexane
- (c) 2-2-dimethylhexane
- (d) 5-5-dimethyl hexane
- (e) 5-2 pentene ethyl.

23. Ethene undergoes mainly addition reaction because it is

- (a) a hydrocarbon
- (b) unsaturated
- (c) easily polymerized
- (d) a covalent compound
- (e) saturated.

24. Alkanes react with the halogens mainly by

- (a) oxidation
- (b) polymerisation
- (c) reduction
- (d) substitution
- (e) decomposition.

25. Which of the following is a secondary alkanol?

- (a) $\text{CH}_3 (\text{CH}_2)_2\text{OH}$
- (b) $\text{CH}_3 (\text{CH}_2)_3\text{OH}$
- (c) $\text{C} (\text{CH}_3)_3\text{OH}$
- (d) $\text{CH}_3\text{CH} (\text{OH}) \text{CH}_3$.
- (e) $\text{CH}_3\text{CH} (\text{OH}) \text{CH}_2$

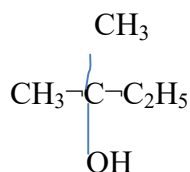
26. When ethanol is heated with excess concentrated tetraoxosulphate (vi) acid, the organic product formed is

- (a) ethanol
- (b) ethanoic acid
- (c) ethane
- (d) ethene.
- (e) methane.

27. What is the main type of reaction alkenes undergo?

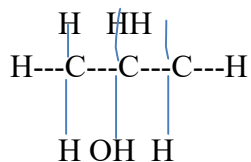
- (a) Addition
- (b) condensation
- (c) Elimination
- (d) substitution
- (e) freezing.

28. The organic compound with the following structure represents:



- (a) Primary alkanol
- (b) secondary alkanol
- (c) tertiary alkanol
- (d) an alkanol
- (e) primary base.

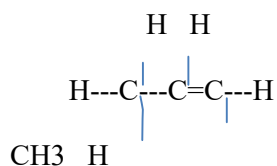
29. Consider the organic compound X with the following structure:



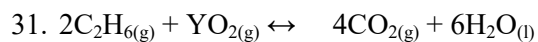
The complete oxidation of X gives

- (a) propanal
- (b) propanoic acid
- (c) propanone
- (d) propene
- (e) glycerol.

30. What is the IUPAC name of the compound with the following structure?



- (a) 2-methylbutane
- (b) 2-methyl prop-2-ene
- (c) 2-methyl-prop-1-ene
- (d) but-1-ene
- (e) but-3-ene.

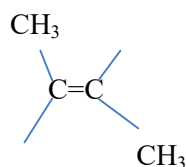
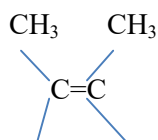


In the equation above the value of Y is

- (a) -3
- (b) 5
- (c) 6
- (d) 7
- (e) 9

32. When propene completely reacts with chlorine, the name of the product formed is
- 1, 1-dichloropropane
 - 1, 2-chloropropane
 - 1, 2-dichloropropane
 - 2, 2-dichloropropane
 - propanol.
33. Which pair of compounds belong to the same homologous series
- C_3H_8 and C_3H_6
 - C_4H_{10} and C_5H_{10}
 - C_2H_4 and C_4H_{10}
 - C_2H_6 and C_4H_{10}
 - CH_2 and C_7H_{10}
34. The final products of reaction of ethyne with excess hydrogen chloride is
- CH_3CHCl
 - CH_2ClCH_2Cl
 - $CH_2=CHCl$
 - CH_3CCl_3
 - CH_3Br .
35. The reaction between C_2H_2 and HBr is called
- addition
 - oxidation
 - polymerization
 - substitution
 - magnetization.
36. The gas given off when ethanol reacts with sodium is
- carbon (iv) oxide
 - hydrogen
 - methane
 - oxygen
 - chlorine

37.



The two compounds represented by the structural formula above are

- geometrical isomers
- optical isomers

- (c) chain isomers
- (d) linkage isomers
- (e) partial isomers.

37. What does X (g) represent in the following equation? $X_{(g)} + 3O_{2(g)} \rightarrow 2H_2O + 2CO_{2(g)}$

- (a) CH₄
- (B) C₂H₂
- (c) C₂H₄
- (d) C₃H₄
- (e) CH₃N

38. Which of the following solutions will not decolourize acidified KMnO₄ solution?

- (a) C₂H₅OH
- (b) C₆H₁₀
- (c) C₆ H₁₂
- (d) C₆ H₁₄
- (e) C₂ H₂₀.

39. An alkyne with six carbon atoms per molecule has a relative molecular mass of [C= 12, H=1]

- (a) 72
- (b) 82
- (c) 84
- (d) 86
- (e) 19.

40. Which pair of gases when mixed in proper ratio produces a very hot non-luminous flame used in cutting and welding metals?

- (a) ethane and oxygen
- (b) ethene and oxygen
- (c) ethyne and hydrogen
- (d) ethyne and oxygen
- (e) hydrogen and oxygen.

41. One of the characteristics of members of a homologous series is

- (a) similarity in method of preparation
- (b) possession of the same relative molecular mass
- (c) existence of the same physical state
- (d) possession of similar structures
- (e) similarity in method of extraction.

42. The IUPAC name for

OH



is:

- (a) benzophenol
- (b) hydroxyphenol
- (c) hydroxybenzene

- (d) phenol
(e) propanol.
43. An example of an element that can catenate is
(a) bromine
(b) nitrogen
(c) chlorine
(d) carbon
(e) argon.
44. Catalytic hydrogenation of benzene produces
(a) cyclohexene
(b) oil
(c) margarine
(d) cyclohexane
(e) soap.
45. Which of the following is used widely in the manufacture of flavours and perfumes
(a) alkanoates
(b) alkamones
(c) alkanes
(d) aliphatic compounds
(e) amides.
46. The by-product of the fermentation of sugar to ethanol is
(a) propane -1, 2, 3-triol
(b) ethylethanoate
(c) ethanedioc acid
(d) carbon (IV) oxide
(e) sulphur dioxide.
47. A compound contains 7.75% hydrogen 37.21% carbon and 55.04% chlorine. Determine the empirical formula of the compound [H= 1.00, C= 12.0, Cl= 35.5].
(a) C_3H_3Cl
(b) C_2H_5Cl
(c) C_3H_8Cl
(d) C_5H_2Cl
(e) C_5HCl
48. A tertiary alkanol has a molecular formula $C_4H_{10}O$. What is the structural formula of the compound?
(a) $(CH_3)_2CHCH_2OH$
(b) $CH_3CH_2CH(OH)CH_3$
(c) $(CH_3)_3COH$
(d) $CH_3CH_2CH_2CH_2OH$
(e) CH_4OH .
49. An alkanol can be prepared by the reaction of an alkene with

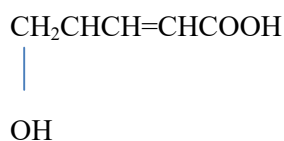
- (a) concentrated tetraoxosulphate (VI) acid
- (b) bromine in tetrachloromethane
- (c) aqueous potassium tetraoxomanganate (VII)
- (d) sodium hydroxide solution
- (e) calcium hydroxide aqueous.

PART B

1. (a)(i) What is a structural isomer?
 (ii) Write all the structural isomeric alkanols with the molecular formula $C_4H_{10}O$.
 (iii) Which of the isomers from 1(a) (ii) above does not react easily on heating with acidified $K_2Cr_2O_7$?

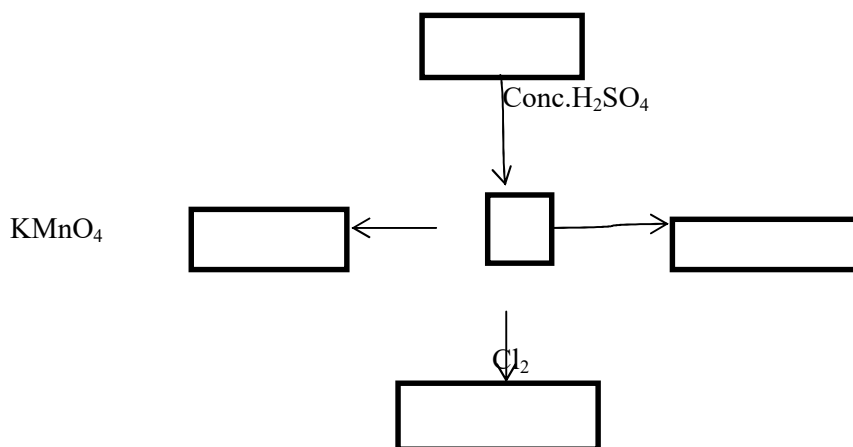
2. (a) What is a functional group?
 (a) State the functional group in each of the following compounds:
 (i) $CH_3CH_2CH(CH_3)OH$ (ii) $CH_3CH_2CH_2COOH$

3. Consider the following organic structure:



State what will be observed when the organic compound is treated with each of the following reagents: (i) cold $NaHCO_3(aq)$ (ii) hot solution of I_2 in $NaOH(aq)$ (iii) bromine water.

- 4.



- (i) What process leads to the formation of K?

- (ii) Write the formula of K.
- (iii) Write the structural formula of L and name L.
- (iv) Name A
- (v) Write the structure of M and name M.

4. A Hydrocarbon Z with molecular formula of 78 on combustion gave 3.385g of CO_2 and 0.692g of H_2O . Determine the molecular formula of Z. (H=1, C=12, O=16).

5. Write the formulae of the following organic compounds:

- (a) 2-methyl-2-hydroxypropane
- (b) 2-methyl-propan-2-ol

KEYS (ANSWERS) TO CHEMISTRY ACHIEVEMENT TEST(PART A).

| | |
|----|---|
| 1 | C |
| 2 | A |
| 3 | E |
| 4 | A |
| 5 | D |
| 6 | C |
| 7 | B |
| 8 | D |
| 9 | C |
| 10 | E |
| 11 | B |
| 12 | D |
| 13 | A |
| 14 | A |
| 15 | C |
| 16 | C |
| 17 | C |
| 18 | C |
| 19 | B |
| 20 | A |
| 21 | A |
| 22 | C |
| 23 | B |
| 24 | D |
| 25 | D |
| 26 | D |
| 27 | A |
| 28 | B |
| 29 | B |
| 30 | C |
| 31 | D |
| 32 | C |
| 33 | D |
| 34 | B |
| 35 | A |
| 36 | B |
| 37 | A |
| 38 | C |
| 39 | B |
| 40 | B |
| 41 | D |
| 42 | A |
| 43 | C |
| 44 | D |
| 45 | D |
| 46 | A |

| | |
|----|---|
| 47 | D |
| 48 | B |
| 49 | C |
| 50 | A |

KEYS TO PART B

1ai. Structural isomers are compounds with the same molecular formula but different arrangement of constituent atoms/or different structures.



2a. A functional group is an atom or group of atoms bonded to a molecule that is responsible for the chemical behaviour of an organic compound.

2b. -OH or hydroxyl group
-COOH or carboxyl group

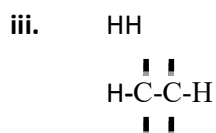
3i. Effervescence occurs

ii. Yellow precipitate

iii. Brown water decolourised

4i. Dehydration

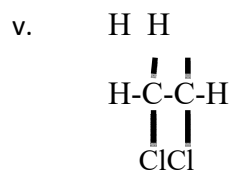
ii. C_2H_4



OH OH

Ethan-1, 2-diol

iv. Polyethene or polyethelene



1, 2-dichloroethane

5.

$$\text{H}_2\text{O} = 16 + 2 = 18$$

Mass of hydrogen in Z = $\frac{2}{18} \times 0.692 = 0.077\text{g}$

$$\text{CO}_2 = 16 \times 2 + 12 =$$

$$= 32 + 12 = 44$$

Mass of carbon in Z = $\frac{12}{44} \times 3.385 = 0.923\text{g}$

C

$$0.923/12$$

$$0.077$$

$$0.077/0.077$$

1

H

$$0.077/1$$

$$0.077$$

$$0.077/0.077$$

1

Empirical formula so, Z = CH

$$(\text{CH})_n = 78$$

$$13n = 78$$

$$n = 78/13 = 6$$

Molecular formula of Z = C_6H_6

CLASS SELF-ASSESSMENT QUESTIONS 1

TOPIC: INTRODUCTION TO ORGANIC CHEMISTRY

- Write or draw the functional groups common to the following homologous series:
(a) Alkane (b) alkene (c) alkyne (d) alkanols.
- Name the following compounds according to IUPAC nomenclature:
 - $CH_2=CH(CH_2)_2CH_3$
 - $CH_3CH_2CH_2CH_3$
- A compound was found to contain 52% carbon, 13.3% hydrogen and 34.7% oxygen. And has a relative molecular mass of 46. Determine the empirical and molecular formula.

4. Draw two possible structures of C_2H_6O and name them.

CLASS SELF-ASSESSMENT QUESTIONS 2.

TOPIC: SATURATED AND UNSATURATED HYDROCARBONS

1. State the general formula of alkanes, alkynes and alkenes.
2. Explain the preparation of saturated hydrocarbons e.g methane.
3. List four physical properties of methane.

4. State four uses of methane.

CLASS SELF-ASSESSMENT QUESTIONS 3

TOPIC: AROMATIC HYDROCARBONS

1. Draw and name the structures of (a) methylbenzene (toluene) (b) phenol (c) aniline (d) naphthalene.
2. Explain the preparation of Nitrobenzene.
3. List four physical properties of benzene.

4. State four uses of benzene.

CLASS SELF-ASSESSMENT QUESTIONS 4
TOPIC: ALKANOLS

1. Draw the structures of ethanol and propanol.
2. Explain the preparation of ethanol.
3. List four chemical properties for ethanol. Include chemical equations.

4. State four uses of ethanol.

DEPARTMENT OF EDUCATIONAL FOUNDATIONS
(WITH EDUCATION PSYCHOLOGY)

FACULTY OF EDUCATION
University Of Lagos, Nigeria

HEAD OF DEPARTMENT

Prof. G. C. Ilogu

B.Sc (UNN), M.A; Ph.D. (SUNYAB, NEWYORK)
Dip; In-Law (Chicago) MNAE



Ext: 1948

Tel: 04932660-1

11th February, 2015

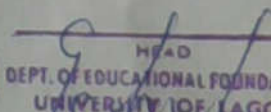
TO WHOM IT MAY CONCERN

LETTER OF INTRODUCTION

This is to confirm that **OGBO, Angela Chinyere**, with Matriculation No. **880804056** is a Ph. D student of Measurement & Evaluation. He is conducting a research on his project "Effects of Student Self-Assessment and Teacher characteristics on Chemistry Learning outcome and attitude to Exam Malpractice in Ogun State, Nigeria".

It shall be greatly appreciated if you could give her the necessary assistance based on the information above.

Thank you.


HEAD
DEPT. OF EDUCATIONAL FOUNDATION
UNIVERSITY OF LAGOS
Prof. G.C. Ilogu

Department of Educational Foundations,
School of Post Graduate Studies,
Faculty of Education,
University of Lagos,
Akoka, Lagos State.
23rd February, 2015.

The Education Officer,
Ministry of Education, Science and Technology,
Oke Mosan, Abeokuta,
Ogun State.

Dear Sir/Madam,

PERMISSION TO CONDUCT RESEARCH IN YOUR SCHOOLS

I humbly seek for your permission to use schools under the ^{OGBO OTA} Ife Zonal Education Office to conduct my educational research. The research which will involve training sessions on Student Self-assessment would likely help to improve academic performance and instil life-long learning in the students.

Please, find attached a letter of introduction from my University. Thank you for granting my request.

Yours faithfully,

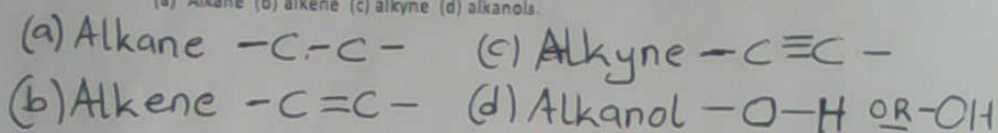


Ogbo, Angela .C. (Mrs).

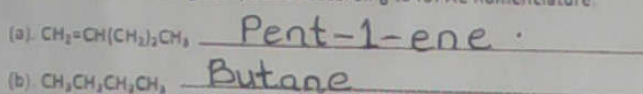
CLASS SELF-ASSESSMENT QUESTIONS 1

TOPIC: INTRODUCTION TO ORGANIC CHEMISTRY

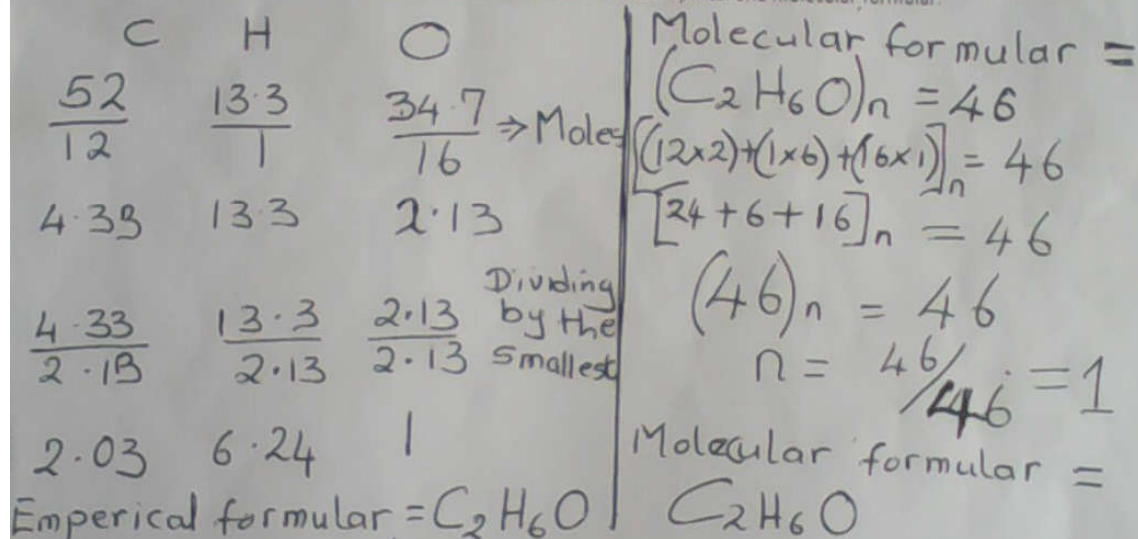
1. Write or draw the functional groups common to the following homologous series:
(a) Alkane (b) alkene (c) alkyne (d) alkanols.



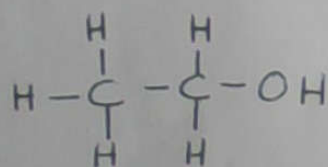
2. Name the following compounds according to IUPAC nomenclature:



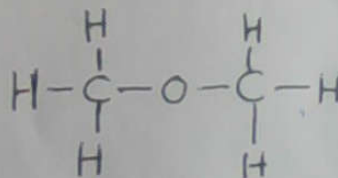
3. A compound was found to contain 52% carbon, 13.3% hydrogen and 34.7% oxygen. And has a relative molecular mass of 46. Determine the empirical and molecular formula.



4. Draw two possible structures of C_2H_6O and name them.



Ethanol.



methoxymethane

CLASS SELF-ASSESSMENT QUESTIONS 2.

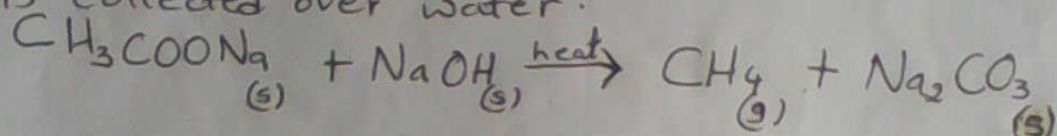
TOPIC: SATURATED AND UNSATURATED HYDROCARBONS

1. State the general formula of alkanes, alkynes and alkenes.

Alkanes — C_nH_{2n+2} Alkenes — C_nH_{2n}
Alkynes — C_nH_{2n-2}

2. Explain the preparation of saturated hydrocarbons e.g methane.

Methane (CH_4) is prepared in the lab. by heating equal amount of sodium ethanoate and sodalime (mixture of $NaOH$ and CaO) — the active reagent is $NaOH$. This reaction gives methane (CH_4) and Na_2CO_3 . CH_4 is collected over water.



3. List four physical properties of methane.

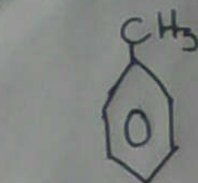
1. CH_4 is a colourless odourless gas.
2. It is denser than air.
3. It is slightly soluble in water.
4. It is neutral to litmus paper.

4. State four uses of methane.

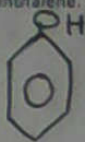
1. CH_4 is used as fuel.
2. It is used in making water gas.
3. It is used in making hydrogen, carbon black, carbon (IV) sulphide, alkyne, hydrocyanic acid trichloromethane (chloroform) and tetrachloromethane
4. Chloroform is used as an anaesthetic in surgery.
5. Tetrachloromethane is used as a solvent.

CLASS SELF-ASSESSMENT QUESTIONS 3
TOPIC: AROMATIC HYDROCARBONS

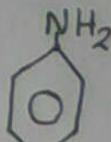
1. Draw and name the structures of (a) methylbenzene (toluene) (b) phenol (c) aniline (d) naphthalene.



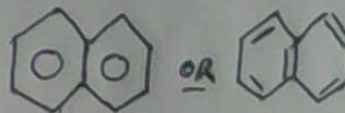
methyl benzene
(toluene)



Phenol



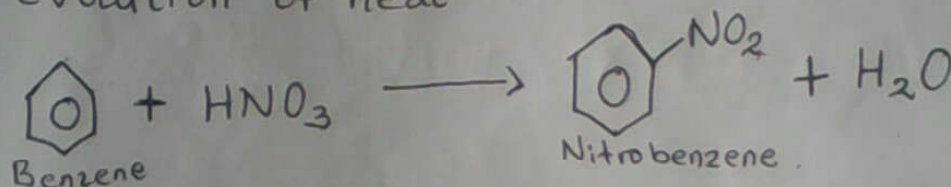
Aniline



Naphthalene

2. Explain the preparation of Nitrobenzene.

Since benzene is unsaturated, it undergoes substitution reaction with HNO_3 acid at room temperature to form nitrobenzene with the evolution of heat.



3. List four physical properties of benzene.

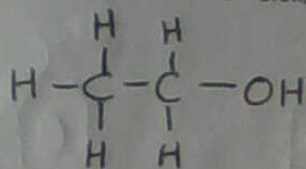
1. Benzene is a colourless volatile liquid with sweet smell.
2. — the vapour is toxic and carcinogenic.
3. — immiscible with H_2O but mixes with organic solvents.
4. — has boiling point of 80°C and freezes at 5.5°C .
5. — Highly inflammable.

4. State four uses of benzene.

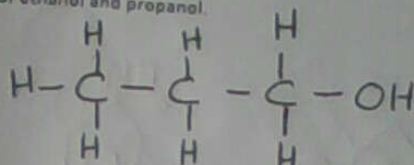
1. Benzene serves as solvent for oil, waxes, and resins.
2. — a good raw material for phenol, nitrobenzene, phenylethene and polystyrene.
3. — used for making drugs, plastic, dye, insecticide, etc.
4. — used as additive for fuel.

CLASS SELF-ASSESSMENT QUESTIONS 4
TOPIC: ALKANOLS

1. Draw the structures of ethanol and propanol.



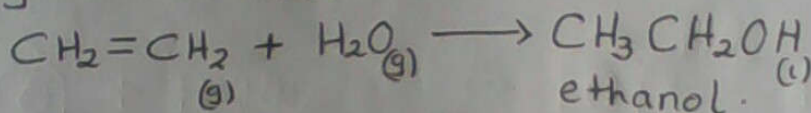
Ethanol
(C₂H₅OH)



(C₃H₇OH) Propanol.

2. Explain the preparation of ethanol.
(LAB. PREPARATION)
OF ETHANOL.

Hydration of a mixture of ethene and steam, using conc. H₂SO₄ as catalyst at 600°C and 80 atm give ethanol:



3. List four chemical properties for ethanol. Include chemical equations.

- Burns in air or oxygen with pale-blue flame to form CO₂ and H₂O. $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_{2(g)} \rightarrow 3\text{H}_2\text{O}_{(l)} + 2\text{CO}_{2(g)}$.
- Reacts with Na and K at room temperature producing H₂ gas and sodium ethoxide.
 $2\text{C}_2\text{H}_5\text{OH}_{(g)} + 2\text{Na}_{(s)} \rightarrow 2\text{C}_2\text{H}_5\text{ONa}_{(s)} + \text{H}_{2(g)}$
- Reacts with PCl₅ at room temperature to give steamy fumes of HCl and chloroethane.
 $\text{C}_2\text{H}_5\text{OH}_{(l)} + \text{PCl}_{5(l)} \rightleftharpoons \text{C}_2\text{H}_5\text{Cl}_{(g)} + \text{POCl}_{3(l)} + \text{HCl}_{(g)}$
- Ethanol is oxidized to ethanal by heating Potassium heptaoxodichromate(VI) (KMnO₄) acidified with dil. H₂SO₄.
 $\text{C}_2\text{H}_5\text{OH} + [\text{O}] \xrightarrow[\text{From KMnO}_4 \text{ acidified.}]{\text{Potassium heptaoxodichromate(VI) (KMnO}_4 \text{ acidified with dil. H}_2\text{SO}_4\text{)}} \text{CH}_3\text{CHO}_{(g)} + \text{H}_2\text{O}_{(l)}$
ethanal
aldehyde
(methanal)

USES OF ETHANOL:

- as fuel and substitute for petrol
- a good solvent for dyes, polish, perfumes, paints, flavours
- constituent of drinks eg beer, wine, whisky etc.
- used in drugs; e.g. tincture of iodine.

① SAMPLE SELF-ASSESSMENT

Name five factors that should be considered in siting a chemical industry.

ANSWER

- a) Nearness to raw materials
- b) Nearness to markets
- c) Nearness to source of energy
- d) Availability of Space
- e) Good Climate Condition
- f) Availability of Labour
- g) Favourable Transport
- h) Government Policy

SCORING CRITERIA

SCORE 4: For naming five factors completely and correctly.

SCORE 3: For naming most but not all of the factors.

SCORE 2: For naming some of the factors.

SCORE 1: For naming none of the factors or wrong factors.

- ② An organic compound with a relative molecular mass of 136 contains 70.57% Carbon, 5.90% hydrogen and 23.53% oxygen. Determine its (i) empirical formula (ii) molecular formula
[H=1.00, C=12.0, O=16.]

ANSWER:

| | | | |
|--------------------------------|---------------------------|---------------------------|----------------------------|
| | C | H | O |
| (i) Moles = | $\frac{70.57}{12}$ | $\frac{5.90}{1}$ | $\frac{23.53}{16}$ |
| Dividing by the smallest | $\frac{5.88}{1.471}$ 4 | $\frac{5.90}{1.471}$ 4 | $\frac{1.471}{1.471}$ 1 |

Empirical formula = C_4H_4O

(ii) $(C_4H_4O)n = 136$

$68n = 136$

$n = 136 \div 68$

$n = 2$ MOLECULAR FORMULA = $C_8H_8O_2$

SCORING CRITERIA:

SCORE 4: For computing completely and correctly with no mistakes.

SCORE 3: For minor errors in calculations

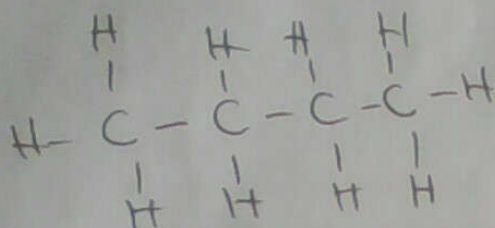
SCORE 2: For major errors in calculations or wrong answers.

SCORE 1: For no calculation, wrong or attempted calculation.

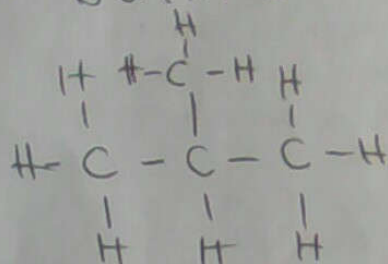
Consider the compound represented by the following formula: $\text{CH}_3(\text{CH}_2)_2\text{CH}_3$.

Write the structures of two possible isomers of the compound and name them.

ANSWER:



BUTANE



2-methyl propane

SCORING CRITERIA:

CORE 4: For naming and writing completely and correctly.

CORE 3: For writing and naming mosts of the compounds but not all.

SCORE 2: For showing some understanding of name and structure.

SCORE 1: For showing no understanding or wrong structure.



COMMUNITY HIGH SCHOOL OJODU ABIODUN

Motto: Labour And Progress

Ref: _____

Your Ref: _____

Date: _____

10th July, 2015

The Head of Department,
Educational Foundations,
Faculty of Education,
University of Lagos,
Lagos, Nigeria.

Dear Sir,

RE: OGBO, ANGELA CHINYERE

With reference to your letter of introduction of **Ogbo, Angela Chinyere** dated **11th February, 2015**; I hereby confirm that she carried out her research in the above named school.

Her research study was satisfactorily carried out in the Third Term of 2014/2015 academic year.

Thank you.

Yours faithfully,





AJUWON HIGH SCHOOL (SNR)

IJU AJUWON

Ifo Local Government, Ogun State

Our Ref: Your Ref: Date 10th July 2015

The Head of Department,
Educational Foundations,
Faculty of Education,
University of Lagos,
Lagos Nigeria.

Dear Sir,

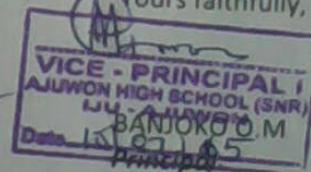
RE: OGBO, ANGELA CHINYERE

With reference to your letter of introduction of Ogbo, Angela Chinyere dated 11th February, 2015; I hereby confirm that she carried out her research in the above named school.

Her research study was satisfactorily carried out in the Third Term on 2014/2015 academic year

Thank you.

Yours faithfully,





MATOGBUN COMMUNITY HIGH SCHOOL

Ifo Local Government, Ogun State

9th July, 2015

The Head of Department,
Educational Foundations,
Faculty of Education,
University of Lagos,
Akoka- Yaba, Lagos.
Nigeria.

Dear Sir,

ATTESTATION:
RE: OGBO, ANGELA CHINYERE

With reference to your letter of introduction of OGBO, ANGELA CHINYERE with matriculation number 880804056, dated 11th February, 2015.

This letter hereby confirms that she satisfactorily carried out her research in this school during the 3rd term on 2014/2015 session. The title of the research was "Effects of Students Self – Assessment and Teacher characteristics on Learning Outcome and Attitude to Examination Malpractice in Ogun State, Nigeria"



Mr. Sulaymon M.O
Vice Principal

Our Ref: _____

Your Ref: _____



Date: 14 - 07 2015

The Head of Department,
Educational Foundations,
Faculty of Education,
University of Lagos,
Akoka, Yaba, Lagos,
Nigeria.

Dear Sir/Ma,

RE: OGBO, ANGELA CHINYERE

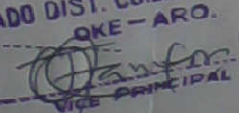
With reference to your letter of introduction of Mrs. Ogbo, Angela Chinyere with Matriculation No: 880804056, dated 11th February, 2015, I hereby confirm that she came to conduct her research titled: "Effects of Student Self-Assessment and Teacher Characteristics on Chemistry Learning Outcome and Attitude to Examination Malpractice in Ogun State, Nigeria".

The research study was satisfactorily carried out in the 3rd term of 2014/2015 academic session.

Thank you.

Yours faithfully,

ABBADO DIST. COMP. HIGH SCHOOL
OKE-ARO.


VICE PRINCIPAL