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## Continuous Assessment as a Predictor Of Students' Achievement in Mathematics at the Junior Secondary School Level in Makurdi Local Government Area of Benue State, Nigeria

**Gabriel Terfa ATONDO, Joshua Abah ABAH, Tertindi NAAKAA**

### Abstract

This study was designed to investigate continuous assessment scores as a predictor of students' achievement in Mathematics at the Junior Secondary School Level in Makurdi Local Government Area of Benue State, Nigeria. It explicitly focused on the correlation and regression between Continuous Assessment scores and Basic Education Certificate Examination (BECE) results. Ex-post facto research design was adopted for the study. A simple random sample of 718 students drawn from five secondary schools in Makurdi Local Government Area was used. Pearson Product Moment Correlation and Regression Analysis were used to answer the research questions while the t-test of correlation coefficient and t-test of regression analysis were used to test the stated hypotheses at 0.05 level of significance. In-depth of analysis of data obtained in the study revealed that there is a strong positive correlation as well as regression between continuous assessment scores and Basic Education Certificate Examination results. The outcome of this study has shown that Continuous Assessment scores can correctly predict students' achievement in Basic Education Certificate Examination Results. Based on the outcomes of the study it was recommended that school authorities should endeavour to submit the actual continuous assessment scores of students to external examination bodies without bias in favour against any results.

**Keywords:** Assessment, Mathematics, Continuous Assessment, Junior Secondary School, Achievement Prediction, Mathematics Education

### Introduction

The history of special education and persons with disabilities world over is characterized by There is a great deal of discussion concerning the importance of designing classroom environment that meets the needs of increasingly diverse population of students. Hence, teachers and educators must carefully consider the knowledge and skills needed by students to be effective in future careers (Long & Stuart, 2004). Additionally, teachers must continually seek and adopt mechanisms of assessment that portrays fairness and equity.

At any given stage of students' education, information is required about their capabilities and readiness for employment and for further studies in the next stage of education. This information is normally gotten from the various subjects as reflected in their examination results. The assessment of students is conducted at the school, state and national levels to provide information for certification and other purposes.

According to the Oxford Advanced Learners Dictionary, assessment means an appraisal or evaluation. It is also viewed as the action or an instance of making judgment about something. Anyor and Abah (2004) explained that in education, Assessment refers to the wide variety of methods or tools that educators use to evaluate, measure and document the academic readiness, learning progress, skills acquisition or educational needs for the students.

Before the implementation of the 6-3-3-4 system of education in Nigeria, there were two types of assessments in the school system namely the internal and the external assessments.

The school conducted the internal assessment to determine the progress of learning and the academic performance of the students. These assessments were conducted during and at the end of each term. Annual examinations were conducted at the end of each year, which were used for promotion and other purposes. The external examination was conducted at the national level to mark the completion of the course by the students. This was the assessment considered for certification of students at the post primary school level.

Many educators tried to query external system of assessment pointing out that, it failed to give what happen to the individual students from the beginning of schooling to the time of evaluation, since examinations were conducted only at the end of the course. Fafunwa (2010) observed that the external examination had created a wrong impression of the possession of paper qualification, which is termed to be more important than the ability possessed.

The weakness of the external assessment had prompted the Federal Government of Nigeria in 1982 to introduce another method of assessment when internal and external assessments are combined for the certification and predication of the further performance of the students (Akem, 2008). This method is known as the continuous assessment. It is the most revolutionary aspect of the current national policy where students' assessment at each level of education incorporates continuous assessment in the final assessment and grading of students. The main aim for this was the liberalization of education assessment. The National Policy on Education (2004) states that "Educational Evaluation will be liberated by adding them in whole or part on continuous assessment of the individual".

Broadly, Continuous assessment is a form of educational examination that evaluates a student's progress through out a prescribed course. It is often used as an alternative to the final examination system. Anyor and Abah (2014) viewed continuous assessment as a learning performance related to a course module and that is separated from examinations and accompanied by regular feedback.

In mathematics, continuous assessment can take various forms depending on the final objectives. Examples include observation of skills and attitudes, insight into a theoretical concept and so on. This can take place within various types of contact moments such as practical, workshops, lessons, placements, project cases etc.

The National Policy on Education therefore has the characteristics of combining continuous assessments scores obtained as a result of internal assessment to determine the overall performances of each student. The combined score which is known as the weighted score is believed to give the true ability and capacity for further studies of each student hence, given the opportunity for correct decision making such as certification and placement of students and for the prediction of their future performance.

Alayafi (2017) and Anyor and Abah (2014) outline the following tools in conducting continuous assessment:

1. *Knowledge Surveys*: These consists series of questions that cover the full content of a course. The survey evaluates the content master at all levels, from basic knowledge to higher levels of thinking. It serves as both formative and summative assessment tools.

2. *Concept Tests*: A concept test is constructed as a resource for science, technology and mathematics instructors to emphasize deeper levels of learning and to give valuable feedback during a learning course.
3. *Mapping*: A concept map is a diagram of nodes, joined by directional lines and organize in hierarchical levels that move from general to specific concepts. Concept maps are used to access how well students see the pictures.
4. *Diagnostic Test*: They access students understanding using multiple-choice test or short answer format that has been designed to address misconceptions.
5. *Interviews*: Interviews enable Instructors the extent of understanding students have developed with respect to series of well-focused conceptual related scientific ideals.
6. *Mathematical Thinking*: These are designed to promote and access thinking skills in Mathematics by checking results and correcting mistakes, making plausible estimates of quantities which are not known, modeling and defining new concepts, judging statements and creating proofs and organizing unsorted data as well as drawing conclusions.
7. *Minute Paper*: Minute paper provides real time feedback from a class to find out if students recognize the main points of a class session. It is a concise note taking one minute and written by student that focuses on a short question presented by the instructor to the class.
8. *Multiple Choice Tests*: This is a flexible assessment choice format that can be used to measure knowledge skills, abilities, values and thinking.
9. *Performance Assessment*: Designed to judge students to use specific knowledge and research skills that require manipulation of an equipment to solve a problem or to make an analysis.

Others include portfolio, scoring rubrics, and weekly reports and so on.

However, the implementation of the continuous assessment also raises many questions regarding the reliability of raw scores or otherwise sent to the State Government and examination bodies by schools. Such questions include; "How reliable are the raw scores sent by each school?" "To what extent can we rely on these scores?" Most of the time, the continuous assessment sent by schools remain very high, while the final assessment scores were very low. Hence, there are some doubts about the reliability and validity of the continuous assessment scores. In fact, it is this doubt that brought about the motivation to undertake this study in other to explore the relationship between the continuous assessment scores and the final examination results and how they influence student's performance in mathematics at the Upper Basic Level.

## Literature Review Theoretical Framework

Instructional theories have been seen as the conglomeration of small, incremental steps sequenced to link information in a logical order (Tennyson, 2010). Instructional theories

entail active learner participation in responding to instructional stimuli with immediate feedback as a positive reinforcement. Philips, Kennedy and McNaught (2012) related that the characteristics of a theory are that, it is derived from empirical evidence or from other theories; that it can provide a generalized explanation of a phenomenon to the accuracy of the evidence, sometimes based on a model, framework or analogy and it can predict the behavior of another instance of the phenomenon. In regards to this study, Piaget's theory of cognitive Development, Brunner's cognitive theory of learning and Kolb's Experiential Learning theory are reviewed.

### **Piaget's Theory of Cognitive Development.**

Jean Piaget (1896 - 1980) was a Biologist who originally studied mollusks but moved into the study of the development of children understanding, through observing them and talking and listening to them while they worked on exercises he set (Joubish & Khurram, 2011). Piaget's theory basically states that children must continually reconstruct their own understanding through active reflection on objects and events till they eventually achieve an adult perspective (Gillani, 2013).

To Piaget, intelligence is represented by how an organism interacts with its environment through mental organization or structures (Schema) that an individual uses to represent the world, driven by a biological impulse to obtain balance (equilibrium) between those mental structures and the environment (Lutz & Huitt, 2004).

Generally, Piaget's work consist of two principal parts; first his theory of adaptation and the process of using cognitive schemes; second, his theory of cognitive developmental stages. The first aspect deals with the concept of schema, assimilation, accommodation and equilibrium. The second aspect posited four major stages of cognitive development that occurs over a lifetime, namely: Sensorimotor, pre-operational, concrete operational and formal operational.

Piaget's schemas are building blocks of intellectual development that adapt to the environmental patterns as learners encounter new learning experiences (Anderson & Pearson, 1984). This adaptation occurs through assimilation and accommodation and is predicated on the belief that building of knowledge is a continuous activity of self-construction (Lutz & Huitt, 2004). Assimilation itself is the cognitive process which integrates new patterns, data or processes into their existing schemata (Gillani, 2013). As a person interacts with the environment, knowledge is invented and manipulated into cognitive structures.

According to Piaget (2001), the change that occurs in the mental structure of a schema is called accommodation. When discrepancies between the environment and mental structures occur, either the perception of the environment can be changed to allow for new information or new cognitive structures themselves can change as a result of the interaction through accommodation. Series of related assimilation and accommodations result in equilibrium, a balance between mental schemas and the requirements of the environment (Lutz & Huitt, 2004).

The combination of maturation and actions to achieve equilibration advances an individual into a higher development stage. Basically, a stage is a period in a child's development in which he or she is capable of understanding some things but not others (Joubish & Khurram, 2011). According to Piaget, the sensorimotor

stage (birth to 2 years old) begins with the reflex actions of infants and proceeds through the development of basic concepts such as time, space and casualty. The sensorimotor stage ends with the beginning of symbolic thought in the child. The pre-operational stage (2 to 7 years) is characterized by the development of symbolic thinking and language.

The concrete operational stage (7 years to adolescence) is marked by a significant increase in the child's ability to analyse and classify patterns according to the attributes of events and objects (Gillani, 2013). At this stage, children attain the cognitive ability of reversal and generalization. The formal operational (adolescence to adult) is marked by the ability to handle abstraction. Individuals at this stage can control variables systematically, test hypotheses and make inferences.

One focal fact that emerges from an in-depth study of Piaget's work is the provision of frame of reference by which educators and educational technologists can analyse the behaviour of a learner and design instructional environments within which students can control their own knowledge (Gillani, 2013). Piaget's theory of cognitive development as a philosophical and theoretical foundation provides answers to the questions of "why" and "how" specific pedagogy, including the administration of continuous assessment should be employed. The cognitive constructivist world view dictates that the search for knowledge is the search for how the world really works and the value of knowledge is determined by its correspondence with the real world (Prawat & Floden, 1994). Utilization of continuous assessment is an indication to make students construct true cognitive structures.

Piaget's theory is important in assessing readiness for learning in school. According to Piaget, children cannot learn certain concepts until they are at a particular stage of development. He argues that teachers should understand that each individual child's cognitive development does not occur quickly and little, if any progress may be assessed on weekly or even monthly basis.

To assess the progress, the teachers should be guided by such questions as: How little or how much of the curriculum does a learner know at the beginning of school year? What changes occur in the behaviour of the learner during and at the end of the school year? What are the individual learner's interest, aptitudes and achievement – at the beginning, during and at the end of the instructional programme? And how effective are instructional methods for each individual learner? Piaget emphasizes social interaction. Children must be involved in the learning process and assessed individually based on each learner's ability.

The use of continuous assessment involves using criteria to judge the adequacy of a problem solution. For example, the learner can follow a predetermined rubric to judge the correctness of his solution to a problem. Assessment leads to formulating hypotheses about future events, assuming one's problem solving is correct thus far. Piaget's cognitive constructivism provides that criteria for judgment (Gardner, 2005). Piaget's theory also provides a profound coherence and understanding in changing teaching practices and standards that are imperative to the choice and employment of assessment and instructional scaffolding techniques.

### **Bruner's Cognitive Theory of Learning**

Jerome Bruner (October 1<sup>st</sup>, 1915 – June 5, 2016) was an American Psychologist who made significant contributions to human cognitive psychology and cognitive learning theory in educational psychology. Bruner was born blind (due to Cataracts) in New York City. An operation at the age of two restored his vision (Bourgoin, 1997). As an adjunct Professor at NYU School of Law, Bruner studied how psychology affects legal practice. A Review of General Psychology Survey published in 2002, ranked Bruner as the 28<sup>th</sup> most cited psychologist of the 20<sup>th</sup> Century.

Bruner is one of the pioneers of cognitive psychology in the United States, which began through his own early research on sensation and perception as been active, rather than passive processes (Bruner, 1947). According to Bruner, the outcome of cognitive development is thinking. The intelligent mind creates from experience “generic coding systems that permit one to go beyond the data to new and possibly fruitful predictions” (Bruner, 1947). Thus, children as they grow must acquire a way of representing the “recurrent regularities” in their environment. To Bruner, important outcomes of learning include not just the concepts, categories and problem-solving procedures invented previously by the culture, but also the ability to ‘invent’ these things for oneself. Cognitive growth involves an interaction between basic human capabilities and culturally invented technologies that serve as amplifiers of these capabilities. As a result, the aim of education should be to create autonomous learners.

In his research on cognitive development of children (1996), Jerome Bruner proposed three modes of representation namely; Enactive (action-based), Iconic (image-based) and Symbolic (language-based) representations. Modes of representation are the ways in which information or knowledge are stored and encoded in memory. In the Enactive (0-1 year) involves encoding action based information and storing it in the memory. The child represent past events through motor responses. This is not just limited to children, adults too can perform a variety of motor tasks (such as typing, sewing, operating a lawn mower) that they would find difficult to describe in picture or word form.

The iconic representation (1-6 years) is where information is stored visually in the form of images (a mental picture in the mind's eye). For some, this is conscious; others say they don't experience it. This is why it is important to have diagrams or illustrations to accompany verbal information when learning a new concept. In the symbolic (7 years onward), this develops last. It is where information is stored in the form of a code or symbol such as language. Symbolic is the most adaptable form of representation for actions and images have a fixed relation to that which they represent. Symbols are flexible because they can be manipulated, ordered, classified and so on. Bruner's theory suggests it is effective when faced with new materials to follow a progression from enactive to iconic representation (Bruner, 1961).

Another focal point of Bruner's work is the concept of discovery learning (Bruner, 1961), Bruner proposes that, learners construct their own knowledge and do this by organizing and categorizing information using a coding system. He believed that, the most effective way to develop a coding system is to discover it rather than being told by

the teacher. The concept of discovery learning implies that students construct their own knowledge for themselves; this is known as constructivist approach to learning. To Bruner, the role of the teacher should be to facilitate the process by designing lessons that help students discover the relationship between bits of information rather than rote learning.

While Bruner has influenced education greatly, it has been most noticeable in Mathematical education. The theory is useful in teaching Mathematics which is primarily conceptual, as it begins with a concrete representation and progresses to a more abstract one. Initially, the use of manipulative in the inactive stage is a great way to hook students who may not be particularly interested in the topic. Furthermore, Bruner's theory allows teachers to be able to engage all students in learning process regardless of their cognitive level of the concept at the moment (Brahier, 2008). In the same vein, Continuous Assessment will be diversified since there are various stages in representation of information. This can help the students to do better as one will not be entirely weak in all aspect of learning and assessment.

According to Bruner, important outcomes of learning include not just the concepts, categories, and problem-solving procedures invented previously by the culture, but also the ability to “invent” these things for oneself. Thus, the basic aim of education and assessment should be to create autonomous learners. Again, in assessing the learners, teachers should adopt numerous approaches in order to let the students have variety of tasks to perform.

### **Kolb's Experiential Learning Theory**

David A. Kolb (born 1939) is an American educational theorist whose interests and publications focuses on experiential learning, the individual and social change, career development, executive and professional education. He is the founder and chairman of Experience Based Learning Systems, Inc (EBLS) and an Emeritus Professor of Organizational Behaviour in the Weather Head School of Management, Case Western Reserve University, Ohio.

Kolb's Experiential Learning Theory (ELT) was propounded by David A. Kolb in 1984 (Kolb, 1984). He was inspired by the work of Kurt Lewin who was a gestalt psychologist in Berlin. Experiential learning theory is a method where person's skills and job requirement can be measured. Kolb's experiential learning theory is based on the following principles:

1. Emphasis is on how learning can be applied.
2. Relate to participant's goals.
3. Relate to participants' past experience.
4. Encourages debate and challenges ideals.
5. Respect for the opinions of participants.
6. Encourages all participants to be a resource for the instructor and the group.
7. Treat participants like adults.
8. Gives the participants elements of control.

Kolb's experiential learning theory works on two levels; a four-stage cycle of learning and four separate learning styles (McLeod, 2013). Kolb' theory has a holistic perspective which includes experience, perception, cognitive and behaviour.

**The Experiential Learning Cycle**

The learning cycle basically involve four stages namely; concrete learning, reflective observation, abstract conceptualization and active experimentation. Effective learning can be seen when the learner progresses through the cycle. The learner can also enter the cycle at any stage of the cycle with logical sequence (Antherton, 2013).

The first stage is concrete learning, where there is encounter of new experience or interpretation of existing experience. Then it is followed by the next stage of reflective observation, where one reflects on the experience on personal basis. After this, the abstract conceptualization, where new ideals are formed based on the reflection or could be modifications of the existing abstract ideals. Lastly, active experimentation stage is where a learner will apply the ideals to his surroundings to see if there are any modifications in the next appearance of the experience. All these lead to concrete experience. This can happen over a short duration or over a long duration of time.

**Kolb's Learning Styles**

Kolb's learning style is explained on the basis of two dimensions; they are how a person understands and processes the information. This perceived information is then classified as concrete experience or abstract conceptualization and processed information as active experimentation or reflective observation (Smith, 2010).

The following learning styles were identified by Kolb

1. *Diverging*: Individuals of this kind of learning style look at things in different perspective. They prefer watching than doing, also they have strong imagination capacity, emotional, strong in arts, prefer to work in groups, open minded to take feedback and they have broad interest in different cultures and people. The learning characteristic is of concrete experience and reflective observation.
2. *Assimilating*: People of this kind of learning prefer good clear information; they can logically format the given information and exploring analytic

methods. They are more interested in concepts and abstracts than in people.

3. *Converging*: Converging type of learners solves problem, put their learning onto practical issues. Also, they prefer technical task, experiment with new ideals and unemotional. The learning characteristics are abstract conceptualization and active experimentation.
4. *Accommodation*: Individuals with this kind of learning style prefer to do things practically; they are attracted to new challenges and solve problems intuitively. The learning characteristics are concrete experience and active experimentation.

According to Kolb (1984), "learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it". Kolb also developed six main characteristics of experiential learning as follows:

1. Learning is best conceived as a process, not in terms of outcome.
2. Learning is continuous process grounded in experience.
3. Learning requires the resolution of conflicts between opposing models of adaptation to the world (learning is by its very nature full of tension).
4. Learning is a holistic process of adaptation to the world.
5. Learning involves transaction between the person and the environment.
6. Learning is the process of creating knowledge that is the result of the transaction between social knowledge and personal knowledge.

Kolb's learning cycle and styles can be represented diagrammatically as shown below:

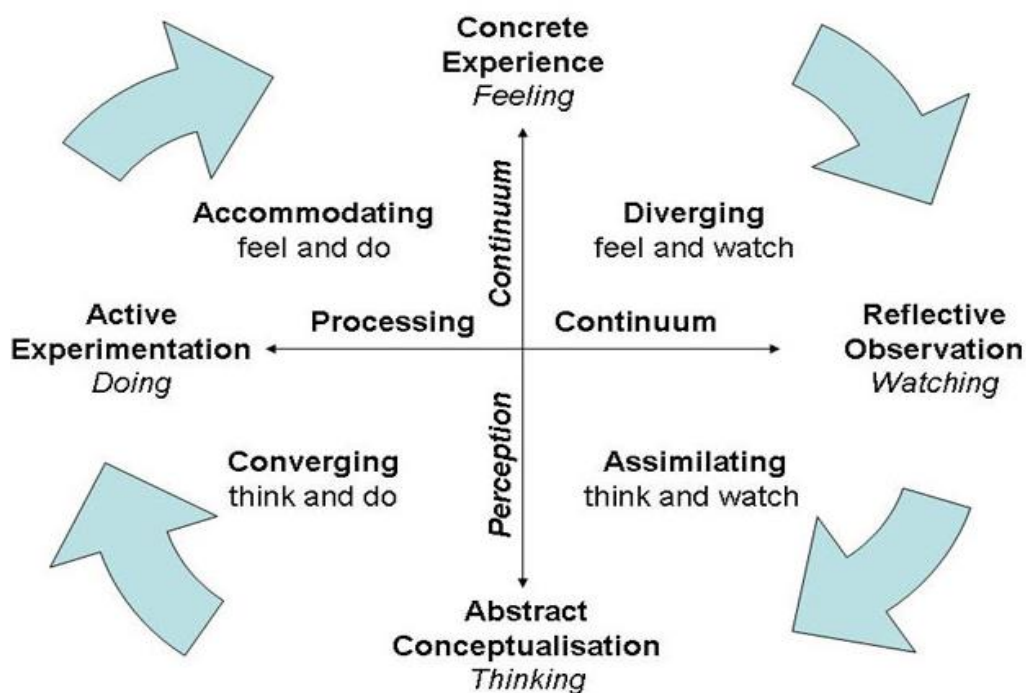
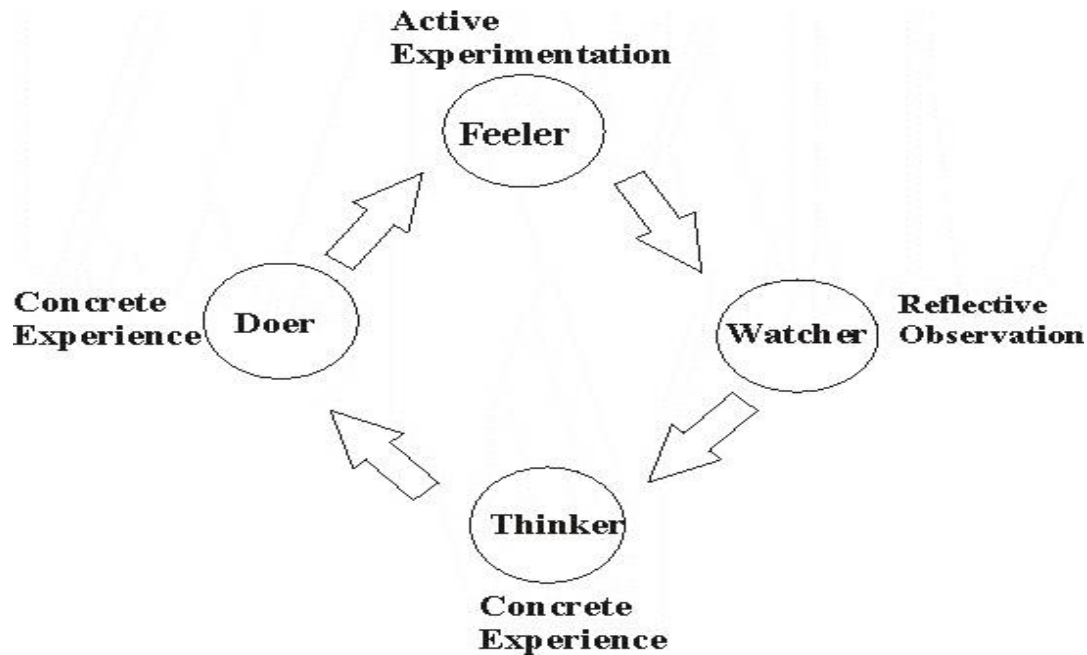


Fig.1: Kolb's Learning Cycle  
~ 22 ~



**Fig.2:** Kolb's Learning Styles

In assessing students, Kolb's theory is of great impact because it helps teachers to develop more appropriate learning opportunities for the learners (Atherton, 2013). Teachers should also design activities that will give opportunities to all the learners to learn in the best way which suits them. This enhances their performance. In the same vein, the activities carried out should make the learner to go through the whole process of experiential learning cycle. As students are given numerous learning opportunities, there is positive relationship between the continuous assessment and their performance.

### **Conceptual Framework Evaluation**

Evaluation according to Groulund (1981) is a systematic process of the extent to which instructional objectives are achieved by learners. Here, evaluation implies a systematic process with prior identification and implementation of instructional objectives which make judgment possible. The emphasis is on the extent to which learning outcomes have been achieved.

In the day-to-day activities of the school system, experience has shown that teachers and those concerned with education require a good deal of information on students. The information obtained is used for various educational decisions on each student at any level of education. Therefore, it is very important that schools should have valuable and accumulated information on each student in the various school activities for effective and rational decision making.

Evaluation itself is described as been comprehensive in nature (Ohuche & Akeju 1977). This type of evaluation is thought as encompassing all assessment strategies employed in assessing student's academic progress. That is to say all types of assessment techniques are employed and used for the purpose of evaluation. Comprehensiveness in evaluation also includes qualitative and quantitative description of the data obtained as a result of evaluation and using such data in making a value judgment of the worth of the data.

### **Types of Evaluation**

The types of information needed on every individual, needs certain type of evaluation technique on that individual.

#### **Formative Evaluation**

Formative evaluation is concerned with a healthy acquisition and development of knowledge and skills by students (Oguniyi, 1984). It goes on during the course of learning and teaching exercise. It is very useful in identifying students' areas of need, in order to guide them towards desired goals.

Evaluation should be carried out at every stage of the planning and implementation of an educational Programme. In the case of 6-3-3-4 system, this was not done and the problems being encountered in some West African Countries can be partly traced to this (Osokoya, 1987).

Formative education as is carried out in African schools is not appropriate because of large enrolment in schools. Also, there is reliance on the use of tests as a major technique of assessment in schools. Other techniques exist as theories that are not practiced. Evaluation in Africa has not addressed societal and educational problems that are eating deep into the fabrics of the educational system, such as drug abuse, secrete cult, unemployment and poor health. Examination malpractice is also on the highest increase at all levels of educational pursuits (Oguniyi 1984).

#### **Summative Evaluation**

Summative evaluation is the evaluation of the total programme after it has been fully developed. At this stage, the conditions under which the programme will be most profitably used are stipulated. It seeks to find out the extent to which the objectives of the programme have been achieved. Summative evaluation is the evaluation used to appraise a product already placed in the market.

Groulund (1991) explained that, summative evaluation appraised the overall effectiveness of the curriculum programme, which helps in decision making. The result of summative evaluation shows the effects of the instructional objectives on the individual learner. It also indicates the

extent to which the objectives are attained, thus giving ground for effective decision making. Such decisions involve grading, certification for the performance and placement of those evaluated. Summative evaluation takes the form of quiz, test, term papers, reports, personal observation of students, class contribution or annual examinations. Some of these forms may be combined to arrive at summative evaluation.

Summative evaluation tells the real story, whether the new programme is yielding better results than the old one. It shows the quality of performance of students in the programme through various forms of measurement and evaluation (NPC, 2006). Summative evaluation at the verification level will enable the curriculum planners to make the final modification on the programme before it is marked for general consumption.

Educationists and educators in particular have called for using the two types of evaluation for the purpose of assessment. They believe that, as the educational system continues to progress, the process can be accessed by employing the formative evaluation while summative evaluation could be employed at the end to measure all attainment of the effectiveness of the programme.

### Methods of Evaluation

Evaluation of students involves the use of varieties of methods, depending on the type of information the evaluator wants to obtain. Schilling (2012) came up with criterion referenced versus norm-referenced types of evaluation. The criterion referenced type measures what an individual can do as a result of learning a content. It measures the individual's performance as a result of learning. The norm-referenced type on the other hand, is concerned with what an individual can do in relation to his norm group as a result of learning a content. It measures the performance of an individual student in relation to his classmates with whom the student is measured.

Another classification identified by evaluators is the evaluation of the maximum performance versus evaluation of the typical performance. Groulund (1981) explained maximum performance as a method of finding out the extent to which a person can perform when at his best. It shows the extent to which a person can perform when motivated to do so. On the other hand, the typical performance reflects a person's typical behaviour. It measures what a person can do under natural conditions.

### Continuous Assessment

Continuous assessment can be seen as a simple combination of two words 'continuous' and 'assessment'. The Longman Dictionary of the Contemporary English (2000) defines continuous assessment as 'continuing without interruption, unbroken'. Assessment as the noun form of assess means 'the value or amount at which something is calculated, a judgment or opinion'. A combination of the two words will then mean a connected unbroken process of assessing a learner up to a particular point in time. Oxford Advanced Learner's Dictionary (7<sup>th</sup> Edition) defined continuous assessment as a system of giving a student a final mark/grade based on work done during a course rather than on one examination. Equally, many educationists have defined continuous assessment in different ways. Alade (2011) defined continuous assessment as a mechanism whereby the final grading of

student is cognitive, effective and psychomotor domains of behaviour takes into account in a systematic and objective process the extent of a student's performance in all the expected changes in his or her behaviour of all information derived with a view of using them to help the student. According to Faleya (1986), continuous assessment is the periodic and systematic method of accessing and evaluating a person's attributes. Information collected from continuous assessment of students will help to better understand their strength and weaknesses in addition to providing a comprehensive picture of each student over a period of time.

From these definitions, one could infer that Continuous Assessment is an assessment approach which involves a use of variety of instruments, assessing various components of learning, not only the thinking process but including behaviour, personality traits and dexterity. Continuous assessment will also take place over a long period of time. Such approach would be more holistic, representing the learner in his/her entirety. Continuous assessment will however, not be successful without the dutiful commitment, diligence and sacrifice on the part of teachers (Airasian, 1991). The task is difficult and calls for dedication, objectivity and hard work on the part of teachers, counsellors and everybody involved in the education of the child.

### Origin of Continuous Assessment

The present National Policy on Education observed that the existing practice (in most institutions of learning) of basing the assessment of students' work on final examination and on only one type as no longer tenable. The policy further points out that the first school leaving certificate examination will ultimately be abolished and primary school certificate will be issued by the Head-teacher of individual schools and would be based on continuous overall guidance-oriented assessment of pupils and not on the results of a single final examination.

The introduction of continuous assessment in the National Policy on Education dated back to 1969 curriculum development conference in a paper presented by National Education Research Council (NERC) NPE (1981). The National Policy on Education has advocated for the following in all institutions of learning with particular reference to 6-3-3-4 or 9-3-4 system of education:

Primary education = C.A.

Junior secondary education = C.A. + Final Examination

Senior secondary education = C.A. + Final Examination

Tertiary education = C.A. + Final Examination.

The continuous assessment in all institutions takes, 40% or 30% of the total mark (depending on the educational level) except for primary education where continuous assessment constitute a total of hundred marks.

### Characteristics of Continuous Assessment

According to Broohart (2011), continuous assessment has the following characteristics:

1. *Systematic*: Continuous assessment is said to be systematic in the sense that it requires an operational plan which indicates what measurement are to be made about the learners' performance, at what time intervals or times



during the school year, the measurements are to be made and the results recorded and the nature of the tools or instruments to be used in the measurement.

2. *Comprehensive:* Continuous assessment is comprehensive because many types of instruments are used in determining the performance. Continuous assessment may come in the form of test, projects, assignments, observations, questionnaires and interviews.
3. *Cumulative:* Cumulative nature of continuous assessment means any decision to be made at any point in time on the learner takes into account of all previous decisions about the child. This requires the keeping of up-to-date or cumulative records of each learner.
4. *Guidance-Oriented:* Continuous assessment is guidance-oriented because information is used to guide the child's placement, career prospects, vocational training and further development.

### Uses of Continuous Assessment

Denga (2004) commented that, "the aim of continuous assessment in the new educational system in Nigeria is that of an all integrative education of the child". In his view, this could include the child's ability, achievement, attitude, character, emotions, interests, vocational skills and that an overdue emphasis on one area to the neglect of others is not the aim but a negation of the aim of the policy.

The assessment of students is always done with an aim in mind. The results so obtained are used for the purpose they are collected. Some educationist such as Grounlund (1981) identified the issue of continuous assessment as applied to education. These uses are summarized below:

1. To appraise the achievements of individual students.
2. To diagnose the learning difficulties of an individual student or an entire class to provide information, helpful in subsequent teaching.
3. To appraise the educational effectiveness of a curriculum instructional materials and procedures as well as organization and administrative arrangement.
4. To access the educational progress of large population in order to provide the public with dependable information to help in the understanding of educational problems and needs and to develop sound policy regarding education.

On the other hand, the major objectives for the implementation of continuous assessment into Nigerian schools are for the liberalization of educational assessment and evaluation. The Federal Ministry of Education, Science and Technology specified advantages of implementing continuous assessment in schools as:

1. Giving the teacher an involvement in the overall assessment of the student.
2. Providing a more valid assessment of students' overall ability and performance.
3. Enabling teachers to be more flexible and innovative in their instruction.
4. Providing a basis for more effective guidance of the learner.
5. Providing a basis for the teacher to improve on his/her instructional method.
6. Reducing examination malpractice in schools.

These advantages give Continuous Assessment the opportunity of assessing teaching – learning process and finding the extent to which instructional objectives have been attained as a result of the instruction. It gives the opportunity of finding the true ability of students at each level of education. This is true since the continuous assessment scores are combined with the end of the course assessment or final result of the student at each level of education.

Most importantly, the result obtained by using continuous assessment system in the evaluation of students, are used for various administrative decisions such as promotion, grading, certification, prediction of future performance and placement of students.

### Empirical Studies

Frazer and Beuke (2011) carried out a research in Pretoria, South-Africa, 500 students were assessed to establish the relationship between continuous assessment and High School Examination. The study used a 20-item questionnaire (Cronbach's  $\alpha = 0.80$ ) to generate scores on students' continuous assessment and their final examination. A further detailed observation of a small number of students ( $N=10$ ) from two combined High Schools used to test the designed tool, reveal that positive relationship between Continuous Assessment and Final High School Examination was established. This present work intends to narrow continuous assessment score of students in mathematics and their Basic Education Certificate Examination result. Also the target sphere of this study is the Junior Secondary School environment which is the indispensable to Basic Education.

Nwachukwu (2005) embarked on the study in the University of Nigeria, Nsukka (UNN) to observe the relationship between Continuous Assessment in Basic Science and the Junior Secondary School result in Enugu state, Nigeria. The study applied a quasi-experimental design on 100 students who were selected from Enugu zone. Their Continuous Assessment Scores and the Basic Certificate Examination Results were considered. It was observed that 92 students had final results that were proportional to their Continuous Assessment Scores. This study by Nwachukwu (2005) relates to the present work in its direct usage of continuous assessment as a predictor of students achievement in mathematics. Students used were from the same level of education but in a different subject. This present work intends to poll the Continuous Assessment of students and Basic Education Certificate Examination Results in mathematics and in Benue State, Nigeria.

Adekeye (2011) conducted a study focused on the relationship between Continuous Assessment Scores and Junior School Certificate Examination Results of students in Kwara state, Nigeria. The study further sought to find out the contributions of each Junior School year to performance at Basic Education Certificate Examination. The sample for the study was made up of 540 participants selected from 18 secondary schools in Kwara state, Nigeria. The data generated were analyzed using Pearson's product moment Correlation 'r', independent 't'-test and multiple regression analysis. It found that the continuous assessment actually predicted student's achievement at the end of the three years in Junior Secondary School especially the male students. This present research is in line with work of

Adekeye (2011) in its use of continuous assessment scores as a predictor of student's achievement in Mathematics Basic Education Certificate Examination. Although the researcher sampled opinions from across several schools, his study was not field specific. The specific use in Mathematics was not ascertained.

In another study, Edwin (2014) investigated the influence of continuous assessment on academic performance of senior secondary school students in Edo State, Nigeria. The researcher designed a well-structured questionnaire for 100 respondents in some selected secondary schools in Oredo Local Government Area. The data generated were interpreted using simple percentage analysis. The data finding revealed that students who were continuously assessed performed better than those who were not assessed continuously. It was also discovered that continuous assessment can lead to eradication of examination misconduct among students. Again, it was recommended that effective records should be kept in schools on student's performance. This present work is subject-area-specific (Mathematics) and draws its sample from Makurdi LGA of Benue State, Nigeria with particular attention to Continuous Assessment as a Predictor of Students' Achievement.

A recent study by Mwebaza (2016) underscores Continuous Assessment and students' performance in 'A' level secondary schools in Masaka District, Uganda. The researcher employs a descriptive survey design on a sample of four hundred and sixty (460) people including 100 teachers, 300 students and 60 Directors of Studies were selected to participate in the study. The study used Questionnaires, Structured Interview and Focused Group Discussions (FGD). The findings of the study indicate that continuous assessment boost students' performance in their academics. The study also reveals that continuous assessment help teachers to assess their own performance and effectiveness of their teaching. The work elaborately identified numerous assessment tools used and their importance. But the researcher draw his sample from across different disciplines, not expounding what the relationship holds for individual subjects such as Mathematics.

### Research Questions

The following research questions guided this study:

1. To what extent does continuous assessment scores predict students' Achievement in Mathematics in the Junior Secondary Schools (JSS) in Makurdi Local Government Area of Benue State, Nigeria?
2. What is the relationship between continuous assessment scores and achievement in Basic Education Certificate Examination (BECE) in Mathematics in the Junior Secondary Schools (JSS) in Makurdi Local Government Area of Benue State, Nigeria?

### Research Hypotheses

The following hypotheses will be tested at 0.05 level of significance.

1. There is no significant regression between continuous assessment scores and Basic Education Certificate Examination (BECE) results.
2. There is no significant relationship between continuous assessment scores and Basic Education Certificate Examination (BECE) results.

### Methodology

Ex-post facto research design was adopted for this study. The ex-post facto research design is a research in which the independent variable of interest has already occurred and in which the researcher begins with the observation on a dependent variable, followed by a retrospective study of possible relationship and impact (Emaikwu, 2011). The ex-post facto design was appropriate for the study due to its scope of coverage in explaining existing relationships and developing trends.

The study was conducted in Makurdi Local Government Area of Benue state, Nigeria. The local government shares boundaries with Guma Local Government Area to the North-East, Gwer-East to the South, Gwer-West to the West and Doma Local Government Area of Nasarawa State to the North-West.

The population of the study comprises 2,709 Junior Secondary School (JSS) students who wrote the 2016/2017 Basic Education Certificate Examination in Makurdi Local Government Area of Benue State, Nigeria.

The sample of the study comprises 718 students who wrote the Basic Education Certificate Examination (BECE) for the 2016/2017 Academic Session.

Simple Random sampling was used for the study. This is because simple Random Sampling gives each element of the population an equal and independent chance of being included in the sample.

The instruments for data collection in this study were the Basic Education Certificate Examination (BECE) results for the 2016/2017 Academic Session and the School Based Continuous Assessment Scores from the sampled schools.

Considering that the Basic Education Certificate Examination (BECE) is organized by the National Examinations Council (NECO) as well as the Benue State Examination Board, the validation of the instrument was established. Since Basic Education Certificate Examination (BECE) and the School Based Continuous Assessment Scores were conducted by certified Examination Bodies as well as various secondary schools based on certain standards, the instrument for data collection were regarded as being reliable.

Data collection was handled by the researcher considering the fact that the sampled secondary schools are located in Makurdi Local Government where the researcher also resides. This is also to avoid misplacement and alteration of exalt existing data.

Data was collected and analysed using both descriptive and influential statistics. The research questions were answered using the Pearson Product Moment Correlation Coefficient and Regression Analysis. The research hypotheses were tested at 0.05 level of significance using the t-test of correlation coefficient and test of regression. The t-test was used because, it provides an appropriate measure of the statistically significant difference between two independent random samples from normal populations whose variances are not necessarily the same.

### Results and Discussion

The presentation of data analysis and interpretation for this study was done according to the research questions and followed by related hypotheses.

#### Research Question One

To what extent do continuous assessment scores predict students' Achievement in Mathematics in the Junior

Secondary Schools in Makurdi Local Government Area of Benue State, Nigeria?

**Table 1:** Regression of Continuous Assessment Scores on Basic Education Certificate Examination Results.

S/NO.	Name of School	R <sup>2</sup>	R <sup>2</sup> (%)
1	School 1	0.58	58%
2	School 2	0.46	46%
3	School 3	0.21	21%
4	School 4	0.77	77%
5	School 5	0.52	52%
	Combined Average	0.58	58%

The data in Table 1 indicates that 58% of Continuous Assessment Scores Correctly Predicts Students' academic achievement in Mathematics in Junior Secondary Schools

in Makurdi Local Government Area of Benue State, Nigeria.

**Table 2:** Regression of Coefficients

	Coefficient	Std Error	t-stat	p-value	Lower	Upper
Intercept	4.7345	1.6702	2.08347	0.0047	1.4554	8.0136
C. A.	2.0223	0.0644	31.4245	6.8E-137	1.8959	2.01846

The results in Table 2 shows that intercept (b<sub>0</sub>) is 4.73 while the Regression Coefficient (b<sub>1</sub>) is 2.02.

Thus;  $Y = b_0 + b_1 x$

Where; b<sub>0</sub> = Intercept

b<sub>1</sub> = Regression Coefficient

From Table 2;

$$Y = 4.73 + 2.02x.$$

For example, a student with a Continuous Assessment Score of 30 is predicted to score thus in Basic Education Certificate Examination (BECE):

$$\begin{aligned} \hat{Y} &= 4.73 + 2.02(30) \\ &= 4.73 + 60.6 \\ &= 65.33 \end{aligned}$$

This implies an appropriate prediction when considered in light of the raw data for this study.

**Research Question Two**

What is the relationship between Continuous Assessment Scores and achievement in Basic Education Certificate Examination?

**Table 3:** Correlation of Continuous Assessment Scores and Basic Education Certificate Examination

Type of Assessment	N	Mean	SD	r
Continuous Assessment	718	25.62	4.16	0.76
BECE	718	56.64	11.05	

The data in Table 3 shows that the Pearson Product Moment Correlation of Coefficient of Continuous Assessment Scores and Basic Education Certificate Examination Results is 0.76. This implies that there is a strong positive relationship between Continuous Assessment Scores and Achievement in Mathematics in the Basic Education Certificate Examination Results in Junior

Secondary Schools in Makurdi Local Government Area of Benue State, Nigeria.

**Research Hypothesis One**

There is no significance regression between Continuous Assessment Scores and Basic Education Certificate Examination Results.

**Table 4:** Regression Analysis

	df	SS	MS	F	p-value	sig
Regression	1	50790.2	50790.2	987.5019	6.8E-137	Yes
Residual	716	36826.04	51.4330			
Total	717	87616.25				

$$\alpha = 0.05$$

The result in Table 4 indicates that, the Regression of the Continuous Assessment Scores on Basic Education Certificate Examination is significant at 0.05 level of significance. This is because the P-value of  $6.8 \times 10^{-137}$  is far less than the alpha ( $\alpha$ ) value of 0.05.

**4.1.4 Research Hypothesis Two**

There is no significance relationship between Continuous Assessment Scores and Basic Education Certificate Examination Results.

**Table 5:** t-test of Correlation Analysis between Continuous Assessment Scores and Basic Education Certificate Examination Results

Type of Assessment	N	Mean	SD	r	t	P-value	sig
Continuous Assessment	718	25.62	4.16	0.76	31.42	68E-137	Yes
BECE	718	56.64	11.05				

$$\alpha = 0.05$$

The result in Table 5 shows that the Correlation of Continuous Assessment Scores on Basic Education Certificate Examination Results is Significant at 0.05 level of Significance. This is due to the fact that, the P-value of 68E-137 is less than the value correlation of 0.76 as well as alpha ( $\alpha$ ) value of 0.05.

### Discussion of Findings

#### Continuous Assessment Scores can Predict the Students' Academic Achievement in BECE in Mathematics

As reported in Table 1 and 2, Continuous Assessment Scores is an accurate Predictor of Students' academic achievement in Basic Education Certificate Examination Results. For instance, a student who scored 30 in Continuous Assessment was predicted to score 65% while the actual score of Mathematics in BECE was 68%. This means a very close result. This outcome is in line with the results Presented by Nwachukwu (2005) and Adekeye (2011) who affirms that Continuous Assessment Score is a fair predictor of final year examinations.

#### There is a Strong Positive Relationship between Continuous Assessment Scores and Basic Certificate Examination Results.

The results displayed in Table 3 indicated that, Pearson Product Moment Correlation Coefficient of Continuous Assessment Scores and Basic Education Certificate Examination Results is 0.76. This shows that there is a strong positive relationship between Continuous Assessment Scores and Students' academic achievement of Mathematics in Basic Certificate Examination results in Makurdi Local Government Area of Benue State, Nigeria. This is established as related to the study by Frazer and Beuke (2011) who maintained that, there is always a positive relationship between Continuous Assessment Scores and Final High School Examination Results.

#### The Regression of Continuous Assessment Scores on Basic Education Certificate Examination Result is Significant

One of the outcomes of this study as presented in Table 4 showed a significant regression at 0.05 level of significance. This is because the probability value of  $6.8 \times 10^{-137}$  is far less than the alpha ( $\alpha$ ) value of 0.05. This finding agrees with Edwin (2014) and Mwebaza (2016) who rightly observed that, high regression exist between Continuous Assessment Scores and Final Year Examinations.

#### The Correlation of Continuous Assessment Scores on Basic Education Certificate Examination Results is Significant

This is true because, from Table 5, the p-value of 68E-137 is less than the Correlation coefficient of 0.76 as well as the alpha ( $\alpha$ ) value of 0.05. Thus, we rejected the formulated Hypothesis Two, which asserted that, there is no significant relationship between Continuous Assessment Scores and Basic Education Certificate Examination Results.

### Conclusion

Insight into Continuous Assessment and Basic Education Certificate Examination shows the extent to which they are related. Generally, the correlation efficient for this study close to 1, implying that, the coefficient is strong and found

to be significant at 0.05 level of significance. The study has specifically established that Continuous Assessment Scores are substantial predictors of students' achievement in Mathematics at the Junior Secondary School level. Obviously, regular and proper administration of Continuous Assessment will boost the students' academic performance in Mathematics. This will subsequently lead to the use of Continuous Assessment Scores as better standard of their achievement at the end of their three years in the Junior Secondary School.

### Recommendations

The following recommendations are made based on the findings of the study:

1. The Federal and State Ministries of Education should put in place regular checks and balances to ensure that different Continuous Assessment strategies are used in all secondary schools. A uniform policy on this practice should be emphasized so that all the schools will benefit from it.
2. There is need to expose Mathematic teacher to in-service training on skills of test and measurement courses. This will go a long way in achieving the stated objectives of Continuous Assessment in the final assessment of students.
3. The school authorities should endeavour to submit the actual Continuous Assessment Scores of Students to External Examination Bodies and if case of adjustment is necessary, they should use statistical models such as linear transformation and others that would be used without bias in favour or against any results.
4. Mathematics teachers who are well versed in evaluation and assessment techniques should be encouraged and their expertise should be utilized for the said purpose.
5. Parents should be aware of different assessment techniques and help their children in this respect.

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