Evaluation of Teaching and Learning Using Formative Assessment for Sustainable Development Goals

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Abstract— **This article focuses on the achievement of sustainable development with the use of formative assessment for quality education. Quality Education is the 4th goal of Sustainable Development Goals (SDGs). It aims at ensuring inclusive and equitable education for all, and the promotion of lifelong learning opportunities for all. Formative assessment has an essential role to play in the teaching and learning process that can bring about quality education. Evaluation is conducted to find out what worked, what did not work, what needs changing before you reiterate the course. Evaluation looks at the extent of progress being made in learning. It does this through measurement tools, and one of these tools is educational assessment; formative and summative. Formative assessment is assessment forlearning. It aims at enhancing learning. It helps the teacher to prepare the students for future achievement.Formative assessment also helps teachers to know the extent of the achievement of instructional objectives. It helps teachers to regularly (daily) assess student's progress in their learning of a subject. Formative assessment is not interested in just passing examination but rather in the integral formation of the learner so that the learner can have a better future. For a sustainable development, learning must prepare students and learners of all ages to find solutions for the challenges of today and the future. This is what formative assessment does for the learner. It is transformative and therefore, helpslearners to make informed decisions and take individual and collective action to change our societies and care for the planet.**

Index Terms— **Evaluation, Sustainable Development Goals, Formative Assessment**

I. INTRODUCTION

The philosophy of Nigerian education demands that education is an instrument for national development and social change: maximizes the creative potentials and skills of the individual for self fulfilment and general development of the society (National Policy on Education, 2014). There are 17 goals which have been adopted for 2030 agenda for Sustainable Development Goals (SDGs), which are important from the point of view of the development of world peace and prosperity. One of these goals is quality education. There is no country that can exist without quality education (Allam, 2017). The aim of this goal is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (Allam, 2017). Among the goals, this article will be looking at the 4th goal which is quality education.

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Education plays a fundamental role in SDGs. It is a key to sustainable development. Most often emphasis is placed on obtaining high scores without evaluating students' learning, tofind out the extent they have understood the lesson and the progress being made. To find out the skills they have learnt can be translated or transmitted to life? Formative assessment is a practical step to shift the idea of teaching for examinations to teaching for understanding among learners.If sustainable development can be achieved through education, there is need for appropriate teaching and learning assessment strategies that can aid the goals of sustainable development. This article will try to explore the relationship between educational formative assessment and SDGs. It will look at the meaning of evaluation, formative assessment, the reason for formative assessment, methods and tools for formative assessment, the meaning of Sustainable Development Goals, the role of formative assessment in SDG, conclusion and recommendation.

Understanding the meaning of evaluation

In educational measurement and evaluation, one of the areas that measurement emphasizes is the goals and methods of instruction. Measurement in a quantitative way describes students' achievement, and in a qualitative way evaluation gives value judgment to students' progress. Evaluation, therefore, builds on the results of measurement. Both are inseparable.

Evaluation is linked to measurement. While measurement looks at numbers and being able to quantify the performance or the abilities, evaluation assists with using the data and information to judge success or failure. Although, evaluation can take place without numerical measurement as it measures performance (Wither 2018). Evaluation, therefore, is concerned about given value judgement. It uses methods and measures to judge student learning and understanding of what is taught for the purpose of grading and reporting.

The term evaluation means checking the 'value' of something or somebody. In education, evaluation is conducted to find out what worked, what did not work, what needs changing before you reiterate the course. Evaluation could be understood as the systematic process of collecting, analyzing and interpreting of information to determine the extent to which learners are achieving instructional objectives. Evaluation can also be the value judgement about a learner's level of performance by means of different assessment instruments (NTI, 2006). As a systematic process, evaluation calls for controlled observation of the learner after he/she has been exposed to instruction, including value judgement and

decision-making. About the learner, data is collected, analyzed and interpreted to make value judgement (Iketaku, 2013). Simply put, evaluation tries to answer,"what progress is being made in learning" (Enyi, 2009).

Evaluation includes both measurement and value judgement. Measurement precedes evaluation and evaluation takes measurement one step further. From this point of view, evaluation comprises two aspects. The first is that process of giving values to the grade or mark that result from teaching. For example, a candidate may score 70 in one test, may be 25 in another test, and still a grade of B or 7 in another. The process of giving meanings to these figures in terms of pass or fail, excellent, good or poor, is evaluation. This process of evaluation comes after that of measurement (Ohuche &Akeju, 1975). The second aspect of evaluation consists of determining the extent to which a program or project has delivered its objective. Virtually any activity can be evaluated. For effective evaluation, it is required that the thing to be evaluated be precisely described, and the objective to be achieved must be stated in advance. For example, if a teacher decides to use a new teaching method for teaching mathematics, and having outlined many processes in the teaching, he/she determines the operations which his/her students must be able to perform at the end of the period. An evaluation of the new method of teaching will require a determination of the extent to which the students are able to perform the given operations. Generally, a test is needed to measure the students' ability to carry out the operations. Following the example above, the extent may be judged from the mean score of students on the test, and from the proportion of students' scoring up to certain marks on the test. It is necessary to make a comparison between the scores and the scores obtained when older method was used, and other factors such as the ease in application and costs of application are considered in the evaluation (Ohuche and Akeju 1975).

One of the most important measurement tools in education is assessment. This is when teachers gather information by giving tests, conducting interviews and monitoring behaviour. Assessment, when carefully prepared and administered ensures its reliability and validity. That is, assessment must provide consistent results and measure what it purports to measure. Evaluationuses the measurements gathered in assessments. For example, teachers use the information to judge the relationship between what was intended by the instruction and what was learned. They evaluate the information gathered to determine what students know and understand, how far they have progressed and how fast, and how their scores and progress compare to those of other students(online.stu.edu 2018). Evaluation uses assessment data to make judgement on the student being assessed.

Evaluation couldbe considered a quality control system that allows for the determination at each step in the teaching-learning process the effectiveness and programming for movement toward effectiveness. It is a tool for clarifying the important goals and objectives of education. Evaluation offers us opportunities to acquire and process the evidence required to improve together teaching and student learning. It,

therefore, incorporates a great variety of evidence beyond written tests (Ohuche and Akeju 1975). Evaluation measures the teaching-learning process.

The fundamental thing about evaluation is "value." When we evaluate, we are simply engaging in some process that is designed to provide information that will help us make a judgment about a given situation. Usually, any evaluation process requires information about the situation in question. A situation comprises such ideas as objectives, goals, standards, procedures, and so on. When we evaluate, we are saying that the process will yield information regarding the worthiness, appropriateness, goodness, validity, legality, etc., of something for which a reliable measurement or assessment has been made (Zizlik 2014).Assessment could be referred to as feedback from student to the teacher about his/her learning, evaluation is feedback from the teacher to the student about the student's learning (gadoe.org). Assessment can also be referred to the process of organizing test data into interpretable forms of number of factors. These data are obtained using a different type of instruments, such as tests, questionnaires and observations (NTI 2006). Assessment can be formative or summative. While summative assessment aims to give an overall evaluation, formative assessment primarily targets *improvement* of the program or the student learning (Black and Wiliam 2003). Formative assessment is an assessment *forlearning*, and summative assessment is an assessment *oflearning*. Hence, the purpose of formative assessment is to improve teaching and learning as will be discussed subsequently.
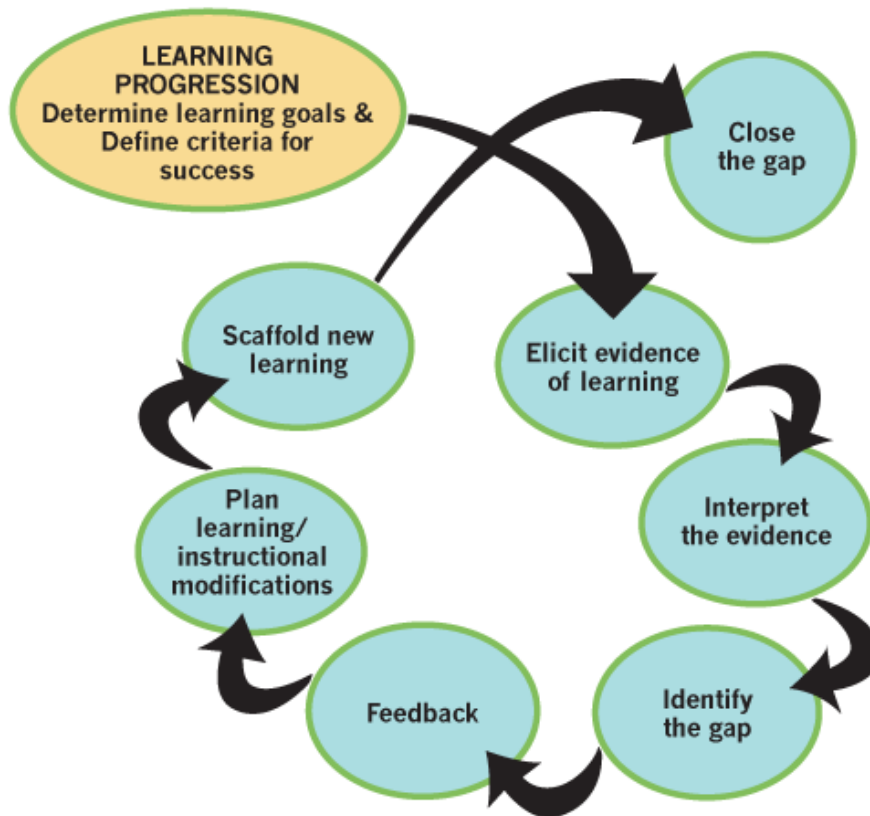
What is Formative Assessment?

Formative assessment denotes various forms of assessment procedures that provides the required information, to adjust teaching during the learning process. It means it is an assessment for learning and diagnostic in nature. It aims at enhancing learning by monitoring student learning (Surbhi 2017).

Formative assessment could be formal or informal. It is undertaken by the teacher at the time of the learning process. Teacher-made test can be used to estimate teaching and learning process. Formative assessment also helps teachers to know the extent of the achievement of instructional objectives. It helps teachers to regularly (daily) assess student's progress in their learning of a subject. The teacher will be able to quickly identify if the students are making progress, if they are struggling with a particular subject and adjust their teaching methods to help students stay on track. On the side of the students, formative assessment helps them to see their own progress and improve their work instantly, which enhances learning outcomes (Skooler 2018).

Formative assessment is central to teaching and learning. Simply put, it is the nucleus of teaching and teaching. Without formative assessment, teaching and learning become a one-way traffic where both the teacher and students are moving in one direction. By so doing, neither the teacher nor the students have room for improvement.

Formative Assessment
Process/Cycle

Source: pinterest.com

When should formative assessment be used?

Formative assessment could be used during the early stages of a new topic when the students have not yet much knowledge about the subject or as a check-in on how they are progressing. Formative assessment involves some level of correction or constructive feedback on the work along with encouraging comments that help students stay engaged and motivated to keep learning (Skooler 2018).Formative assessment can be done during the learning process and at the end of a subject. How it is used depends on the teacher.

It is important to note that regular use of formative assessment gives the teacher the ability to proactively engage and understand how his/her students are performing before the summative evaluation takes place (Skooler 2018). In other words, formative assessment helps the teacher to prepare the students for future achievement. At the end of learning a subject, students should be able to do better in the next level which is certification or awarding of grades.Formative assessment is on-going, it involves ongoing course work. Because it is on-going, formative assessment requires procedures or processes for the attainment of the goals of teaching-learning.

Often, writers do not make distinction between the methods and tools for formative assessment. They are treated as one. I will try to make a distinction between both.Method is a way of doing something and we can call it a process. While tool is a device which can be used to carry out something, maybe a task. It should be noted that in terms of assessment, a method is a general approach to assessing such as observation of practice, while a tool is something supporting that method such as recording something you observe using a mobile device. For instance, questioning is a method, and question cards are a tool (teachingspace.com 2020).

II.   METHODS OF FORMATIVE ASSESSMENT

Some of the most direct methods of formative assessment, according to Bugg (2013) are questioning and discussion. When good questioning techniques are used by an educator, it allows him/her to determine the degree and depth of student understanding. Effective questions do not require students to only recall or state information but to explore ideas and provoke thought. They help to open classroom dialogue that can be used to increase student learning and lets an educator to assess where a student is in the learning process.

In discussion, a few students may dominate but questioning can be used to involve more students in discussion. For instance, a teacher can use '*pose*, *pause*, *pounce*, *bounce'* method (theteachingspace.com 2020). It is a questioning sequence which provokes deep thinking. The teacher poses a question; he/she pauses to allow suitable thinking time; pounces on one student for an initial answer; and finally bounces the answer to another student who builds on the response (Sherrington & Stafford, 2013). This can be

combined with *Think - Pair -Share* (TPS) method. It is a collaborative learning method where students work together to solve a problem or answer a question about an assigned reading. This method requires students to think individually about a topic or answer to a question, he/she shares ideas with classmates. It helps focus attention and engage students in comprehending the reading material (readingrockets.org, 2021).

Like questioning, student observation is another method of formative assessment. The more an educator knows about the students, the more assistance he/she can provide. By observing students throughout instruction, an educator can determine what students know and do not know, as well as their individual strengths and weaknesses. Anecdotal notes can be used to record data and information collected throughout observation.Anecdotal notes are short notes written during a lesson as students work in groups or individually, or after the lesson is complete (Bugg 2013).

Formative assessment can be done through use of entry and exit slips. These slips require a written answer, explanation, or solution to a question or concept that an educator has presented. Entry slips are given at the beginning of class and requires students to answer a question like the one from a previous class or past assignment.Exit slips are given at the end of class and typically require students to answer some type of question based on the day's objective, lesson, or activity (Bugg 2013). For exit slip, students can be asked to write for one minute on the most meaningful one thing they learned, one thing they are curious about, one thing they don't understand, visual art or photography or videography (Thomas 2018).

Formative assessment of students can also be done using probes. A probe is an assessment based on inquiry and exploration. The use of probes helps an educator to measure how much learning has taken place throughout instruction by comparing the scores of pre-test, middle-test, and post-test. The pre-test helps measure the extent of pre-existing knowledge a student has, and it helps an educator plan instruction based on data collected. The middle-test provides a rough idea of where students are and what learning has taken place up to that point.Finally, the post-test helps determine the extent of growth during an instructional episode, such as a unit or chapter (Bugg 2013).

Peer assessment is another formative assessment method. This method entails a peer assessment roundabout where learners are in groups of four and pass each other's work around to check. Nevertheless, before peer assessment method is introduced to the group, although there are a few things it is important to remember before you introduce it to your group:

- Learners should be giving each other feedback as opposed to grading each other's work.
- Learners must be taught how to give constructive feedback - don't just assume they know what to do. **The ladder of feedback** can be a useful way toapproach peer feedback.
- Learners will need an understanding of any criteria to consider or what 'good looks like'. A model answer or rubric can be helpful here.

- You might need to pair learners strategically.

III. TOOLS FOR FORMATIVE ASSESSMENT

Teachers develop assessment tools to enable them to measure students' progress in the classroom. Formative assessment tools are teacher-made tools, not necessarily for grading but they are intended mainly to guide a student to mastery of the given subject and inform the teacher where he/she needs the student to focus (Leo 2020). Tools of assessment to be used depend on the objectives of the lessons or subjects that are taught. There are various changes in behavior that can take place in the students during teaching. Each of these changes requires a particular type of assessment tool to measure it. This implies that there is no one single assessment tool that may be adequate to measure all the changes in behaviours or the objectives of the teacher's lesson (NTI 2006).

Formative assessment tools can be divided into objective and subjective assessment tools. Objective assessment tool is used to assess a student's knowledge of particular facts and figures that are universal. For example, true/false and multiple-choice questions. On the other hand, subjective assessment tools need more creativity and opinion on the part of a student. Example of these are questionspapers or tests that rely on the presentation of arguable material, essay questions, research papers and argumentative speeches. Also, student's tastes, personality and approach to education can more effectively be observed with subjective assessment tool. Apart from being applied separately, objective and subjective can as well be used in conjunction in a section. For example, multiple-choice questions and essay at the end (Leo 2020).

Various tools can be used to assess students' learning. Different people have outlined various forms or types of assessment tools. These tools can be technology enhanced, and some other techniques developed by the teacher. Some other teacher's assessment tools are homework, assignments, tests, interviews, oral reports, papers, instructor's observation and weekly quizzes (Leo 2020), live quiz games, quiz tools, video (Davis 2015). Murugesan (2018) outlined various technological devices for formative assessment such as Edulastic, Nearpod, PlayPosit, Edpuzzle, Flipgrid, Lesson up, Spiral, Pear Deck, Classflow, Goclass, Classkick, Mentimeter, ASSISTments, Formative, Kahoot, Plickers, Sero, Slido, Socrative, Gimkit Live, Quizalize, Go Soapbox, The Answer Pad, Poll Everywhere, Kaizena, Microsoft Teams, Yo Teach.

I would like to add that in the use of formative assessment tools, the students' context must be put into consideration. The teacher uses what is available or what he/she can improvise within his/her context. The teacher must be creative and innovative to know the assessment tool that best suits the needs of the students. For instance, it could be teacher-made test for identifying strengths and weaknesses since test is one of the tools for measuring learning.

Sustainable Development Goals (SDGs)

The concept of sustainable development was introduced by the Brundtland Commission (formally the World

Commission on Environment and Development) in 1987. The concept developed as a response to a growing concern about human society's impact on the natural environment (Nevin, 2008).

The Sustainable Development Goals (SDGs) was launched from January 2016 after Paris Conference when 184 member states and education community gathered for the world development. The aims were to meet the targets, see implementation, coordination, financing and monitoring with the collective efforts of the nations of the world (Allam, 2017). Seventeen (17) goals with 169 targets were set for the world community. The 17 SDGs are delineated as follows: 1- No Poverty, 2- Zero Hunger , 3- Good Health and Well-Being, 4- Quality Education, 5- Gender Equality, 6- Clean water and Sanitation, 7- Affordable and Clean Energy, 8- Decent Work and Economic Growth, 9- Industry, Innovation and Infrastructure, 10- Reduced Inequalities, 11- Sustainable Cities and Communities, 12- Responsible Consumption and Production, 13- Climate Action, 14- Life Below, 15- Life on Land, 16- Peace, Justice and Strong Institutions, 17- Partnership for the goals(Allam, 2017). The 4th goal which is quality education aims at ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all. A quality education, therefore, is "one that is pedagogically and developmentally sound and educates the student in becoming an active and productive member of the society. A Quality Education is not one that is measured purely by a test score or by how many words per minute a 5-year-old can read" (Slade, 2021). For education to be qualitative, formative assessment in teaching and learning is required for a desired outcome.

The Role of Formative Assessment on Sustainable Development Goals

What role does formative assessment play in sustainable development?At the second World Summit on Sustainable Development in Johannesburg in 2002, the United Nations called for quality education as an essential tool for achieving a more sustainable world. It called for the promotion of Education for Sustainable Development (ESD) which aims at promoting knowledge, skills, understanding, values, attitudes and behaviours in people to care for the environment. One of the major things ESD should do is to *employ a variety of educational methods*, such as literature, art, drama and debate to illustrate the process (Nevin, 2008).

Formative assessment (assessment for learning) on sustainable development can be referred to a systematic approach geared towards facilitating learning and providing comprehensive evidence of learner's knowledge, skills, values, and attitudes related to sustainable development (Bramwell-Lalor, 2018). Learning must prepare students and learners of all ages to find solutions for the challenges of today and the future. Education should be transformative and therefore, help us to make informed decisions and take individual and collective action to change our societies and care for the planet (UNESCO, 2021). Formative assessment is transformational because its practices can change how a teacher teaches, how a student learns and how the classroom functions (Miller, 2015). Teachers through formative

assessment give specific and actionable feedback to students that they can use to refine their work, seek out resources, and engage in learning that is particular to their needs (Miller, 2015). This means that when learners are prepared well, they will in turn transmit what they have learnt to the development of the society. Formative assessment is learning not only by cognition but learning by doing. Learners become resources for the peers and society at large.

Normally, the objectives of a lesson are classified into the three domains: cognitive, affective and psychomotor. A variety of instruments are used to assess the three domains of learning. Cognitive domain is concerned with knowledge, affective domain is concerned with emotional responses like interests, appreciation, attitudes, feelings and values. The psychomotor domain is concerned with physical, motor and manipulative skills. In making formative assessment compatible with the goals of sustainable development, emphasis must be placed on developing high-level cognitive and non-cognitive/transferable skills, such as problem solving, critical thinking, creativity, teamwork, communication skills and conflict resolution, which can be used across a range of occupational fields (sdg4education2030.org, 2021). To give a central place to strengthening education's contribution to the fulfilment of sustainable development goals - human rights, peace and responsible citizenship from local to global levels, gender equality, health - the content of such education must be relevant, with a focus on both cognitive and non-cognitive aspects of learning. The knowledge, skills, values and attitudes required by citizens to lead productive lives, make informed decisions and assume active roles locally and globally in facing and resolving global challenges can be acquired through education for sustainable development (ESD) and global citizenship education (GCED) (sdg4education2030.org, 2021).

IV. CONCLUSIONS

One of the goals of sustainable development is quality education. That is the 4th goal of SDGs. Quality educations involves developinghigh-level cognitive and non-cognitive/transferable skills, such as problem solving, critical thinking, creativity, teamwork, communication skills and conflict resolution, towards enhancing the local and lobal challenges in the world. This is where formative assessment comes in. The essence of formative assessment is to improve teaching and learning. It is assessment *forlearning*. Formative assessment prepares students to on how to be responsible citizens, on how to develop their socio-economic environment, and other areas needed for a sustainable society. With assessment methods and tools, give specific and actionable feedback to students, and students in turn use them to refine their work, seek out resources, and engage in learning that is particular to their needs and the those of the society in which they live.

V. RECOMMENDATIONS

For the achievement of a sustainable development, the

writer of this article recommends the following:

1. In schools, emphasis should be placed on formative assessment (assessment *forlearning*) to shift the idea of teaching for examinations to teaching for understanding among learners.

2. The use of assessment methods and tools that can aid the goals of sustainable development, especially quality education.

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