# CHAPTER 1

## Review of Basic Education Science Teachers' Assessment Practices in Nigeria

Stella Gideon Danjuma (PhD)[1], Naomi Thomas (PhD)[2] & Sunday Adah Igoh[3]
[1,2,3]Department of Science Education, Taraba State University, Jalingo

### Introduction

Education can be described as the process in its entirety through which children, younger or even adults are helped to cultivate and grow their abilities, attitudes, values and other forms of behavioural attributes that represent positive value aimed at changing the individual to enable him/her contribute to the well-being of himself/herself and other members of the society and of course the society (Amadioha & Akor, 2018). This definition implies that education grows, advances and has the capability to induce a person with characteristics that would make the person function properly, and besides that, the capacity so developed are usually of value and that which could make the person to contribute positively to the development of the society that the people live in. But even if education is entire, it is broken into stages like what (FRN, 2020) enumerated to include early childhood education, basic education, secondary education, mass literacy, adult and non-formal education, science education, technical and vocational education, tertiary education and open and distance education in Nigeria and in most parts of the world. Basic education according to Kanno & Onyeachu (2015) is defined as the foundational educational level. This may also by implication be seen and perceived as the most fundamental education that is given to people. For Nwana (2002) basic education is seen as the base-line education on which all other educational advancement depends.

The basic education in this context is like the foundation of a building on which all other loads for the building come. This same foundational education from inference determines the stability of the entire educational building that anyone can ever have. Therefore, basic education is to a large extent what determines the success or failure of all other stages of education that may come on it. Hence, it becomes imperative to make this educational level functional to produce results worthy of the effort inputted by the implementers in Nigeria. Basic education in Nigeria has its roots in the original educational system put together for Nigeria by the British starting from when Reverend Thomas Birch Freeman and Mr. and Mrs. Degraft of the Wesleyan Methodist Church arrived in Nigeria precisely in Badagery and established a school, particularly a private home school (Amadioha, 2018). This basic educational process has spanned from 1842 to this present day such that it has graduated from the (3Rs), Reading, Writing and Arithmetic to the Universal Primary Education (UPE) Programme that was on the front burner as at the time between 1955 for the Western region of Nigeria under the leadership of Pa Obafemi Awolowo, 1957 for the Eastern region under the leadership of Dr Nnamdi Azikiwe to the general UPE that resurfaced

in 1976 under the leadership of General Olusegun Obasanjo and then to the present day UBE (Universal Basic Education), (Amadioha, 2016; Jeremiah & Alamina, 2017 ).

**Importance of assessment in science education**

The importance of Science Education in national development cannot be overemphasized. The importance of assessment in science education include:

i. Assessment in science education promotes motivation on the part of the students
ii. It enables the science teacher to know the strength and weaknesses of students in class
iii. It helps the science teacher to monitor educational progress or improvement. It allows the teacher to know if the behavioural objectives are achieved or not.
iv. It is a way to diagnose students' academic performance but also an effective tool for improving the quality of the educational process as a whole.

**Purpose of the review**

Assessment and learning are closely related; hence this review is aimed at helping teachers redefine expectations of learning outcomes while giving students instructions.

**Assessment in Education**

Assessment **is** the systematic process of gathering information about what a student knows, is able to do, and is learning to do. Assessment is a process of finding out the extent to which a learning objective has been achieved after an instruction. It refers to the use of a number of strategies in finding out how proficient a pupil is following a series of instruction. According to Inyang (2012) the extent of manifestations of traits expected to be brought about in a pupil following a learning process may be expressed in numbers (i.e. quantitative) or it may be expressed in words (i.e. qualitative) or in combination of words and numbers according to situations.

**Types of assessment**

1. **Formative Assessment:** Formative assessment provides feedback and information during the instructional process, while learning is taking place, and while learning is occurring. Formative assessment measures student progress but it can also assess your own progress as an instructor.
2. **Summative Assessment:** Summative assessment takes place after the learning has been completed and provides information and feedback that sums up the teaching and learning process. Typically, no more formal learning is taking place at this stage, other than incidental learning which might take place through the completion of projects and assignments.
3. **Diagnostic Assessment:** Diagnostic assessment is a type of assessment which helps the teacher identify students' current knowledge of a subject, their skill sets and capabilities,

and to clarify misconceptions before teaching takes place. Knowing students' strengths and weaknesses can help the teacher plan better what to teach and how to teach it**.**

**Purposes of assessment (improving learning, measuring student achievement)**

The purpose of assessment in education is two-fold:

i. To help students to demonstrate their learning, provide feedback on the errors they've been making.
ii. To provide opportunities for students to do better in their performance with each assessment.

Assessments help the students understand their errors, understand the feedback received on their errors, and help them improve. Assessments may also provide another opportunity to assimilate the new information and re-do the exam to improve performance.

**Assessment practices in Education Basic science**

Science education is learning science by acquiring and developing conceptual and theoretical knowledge through scientific inquiry and problem solving. Olarinloye (2007) sees science education as the identification, development and use of talents, processes and skills for societal progress. It is one of the areas in the wider world which sharpen and mould the character of the 21St Century especially in technologies which have revolutionized the way we live and think. Science education aims at providing scientifically literate citizens as well as producing a potential of scientific and technological manpower. Achievement in science education will go a long way in reducing illiteracy and poverty which are impediments for national development. Science education is a discipline that is concerned with, sharing science content and processes with individuals that are considered as part of the scientific community.

Nigerian Science Educators, however became interested in science development in schools. This desire is essential in order to bring about a widespread understanding of science among the entire population. The primary objective of which has been to develop skills in young people which enable them to make national choice in problem situations relating to their environment. Others include;

i. To rationalize curricula and render it more relevant for the African environment
ii. To establish scientific literacy among the population so as to minimize or abandon colonial exploitation
iii. To debunk myth and superstition so as to rationalize people's ideas and practice
iv. To effect change in philosophy, methodology and materials in science classroom
v. Through the use of local materials, the learners should be able to inquire into natural phenomena and nationalize his traditional practices
vi. The development of independent learning skills and application of science to solving societal problems.

It is only through a well-designed, implemented well evaluated science curriculum that these goals/objectives can be achieved. Adeyegba (2014) submitted that the curriculum generally is the hub of the activities in any educational endeavour. Since it dictates what is to be taught, at what level by whom, with what equipment and for what purpose and assessed/evaluated by what means.

**Assessment strategies used by Education Basic science teachers**

i. **Observation:** this is carried out in different situations to obtain information about the learners' behaviours. The evaluator can watch the learners and study their behaviour systematically. This strategy is very suitable for the effectiveness and psychomotor domains

ii. **Interviews:** learners can be interviewed to obtain information about their progress, problems, strength, weakness and even other participants. Interview can be structured and unstructured. Structured interview is made up of series of questions that are being asked in a particular order which makes it less time consuming while the unstructured interview comprises of few questions but no specifications or indications of how the questions are to be asked. There is therefore room for deeper probing to get more information which makes it time consuming

iii. **Anecdotal records:** This strategy involves a brief record or description of the learners' specific behaviors especially in the affective domain. Such records are made when such behavior occurs which thus provide the evaluator with a profile of change that have occurred in a learner.

iv. **Checklist:** this contains a list of statements about certain behaviour traits. The teacher or evaluator observe and determine whether a particular behaviour trait is present or absent in a learner. The main focus is the determination of the presence or absence of particular behaviour traits and not the affective and psychomotor domain of educational objectives.

v. **Rating scale:** this is an improvement over the checklist technique. It is not only interested in recording the presence or absence of a trait but also in the extent or the quality of the presence.

vi. **Projects:** these are geared towards relating the curriculum activities towards problem situations in the society. They can be assigned to the learners to enable the teacher or evaluator determine the extent to which the leaner can use classroom activities for problem solving. They help to access the learners' originality, creativity, initiative, judgment, attitude and values and to some extent or in some cases manipulate skills.

vii. **Assignment:** assignments and projects are similar but differ in scope, intensity and duration. Assignments are given more often and duration for their completion is shorter. The scope is also narrower than that of a project. In assignment, the learners are evaluated by giving them specific tasks/works to be completed and submitted within a short period of time.

viii. **Test:** these are the most commonly used for evaluation purposes, especially in the cognitive domain of educational objectives. They comprise a set of questions set for the learners to answer independently so as to determine the extent to which the objectives have been attained. The most commonly used test is the teacher-made test. Others include: standardized tests, performance tests which assess physical skills and creative ability.

ix. **Questionnaire:** this can be used to elicit a respondents' responses to a written set of questions. It provides for participation in evaluation by many and various people. It can be administered to large number of people at the same time. Questionnaire can be structured or open ended. In the structured type, the respondent selects one or more option from others while in the open- ended questionnaire, there is freedom for the respondents to answer in his/her own words the way he/she wants to respond to the questions.

**Challenges faced by science teachers in assessing student learning**

Teachers charged with delivering science instructions have recently faced challenges which include but not limited to:

i. Insufficient funding to teach large classes
ii. Poor training and retraining programs
iii. Inadequate laboratories
iv. Inadequate or lack of instructional materials
v. Poor motivations and incentives in all ramifications
vi. An unconducive working environment
vii. Inadequate infrastructural facilities
viii. Ineffective supervision
ix. Poor curriculum development and a lack of resources

**Teacher Factors Influencing Assessment Practices**

Teachers' assessment practices are influenced by a variety of factors. Personal factors such as teacher rank, years of teaching experience, and self-efficacy have been found to impact teachers' formative assessment practices.

**Teacher's knowledge and beliefs about assessment**

Assessment is not merely testing (Osokoya, 2016); it is a process through which the quality of an individual's work or performance is judged. The use of classroom assessment is strongly supported to promote student learning. However, assessment for promoting learning is not yet widely used. On the contrary, summative assessments are emphasized more than formative and teachers continue to use classroom assessments primarily for grading students. McMillan et al., (2013) asserted that formative assessment remains an umbrella term for various practices. To provide a unifying teachers' attitude and beliefs about students provide the foundation for their philosophy of teaching. Teachers enter teaching with prior knowledge and beliefs about learners,

learning and classroom teaching. These beliefs affect teachers' choices of assessment strategies. Assessment is a challenging task and effective classroom assessment requires knowledge of the approaches of assessments and mastery over assessment strategies. Therefore, teachers need to be educated and skilled in the application of classroom assessment. Sikka etal., (2017) found that many teacher education programmes do not require prospective teachers to take up courses in classroom assessment, and in-service teachers reported that they were not well prepared to assess students' learning. As a consequence, teachers neither have knowledge of classroom assessment nor of large-scale testing

**Teacher's confidence and self-efficacy in assessing science**

The feat of any teaching strategies and practices depends on teachers' self-perception, attitude, and confidence in their professional capacity to face up to the changes involved in teaching-learning process. This self-perception, called self-efficacy belief, plays a key role in the way teachers select homework and activities for students. It also determines their efforts and persistence in addressing certain challenges, as significant as affecting their emotional reaction in facing tough situations. In addition, it has been proven that person's self-efficacy is strongly related to their motivation (Ates & Saylan, 2015). Thus, it can be said that teacher self-efficacy is the set of beliefs teachers hold regarding their abilities and competencies to teach and influence their students regardless of outside influence or obstacle. Teachers with high sense of self-efficacy levels are equipped with the zeal to teach and educate. They are open to novel ideas, and new methods and they use student centered-approaches in teaching (Koc, 2013). This means that they support students' autonomy, are patient towards failure and criticize less when students make mistakes. Such teachers provide extra support to low achieving students, create students' perceptions regarding academic skills and identify available goals. They use more humanistic classroom management approaches. On the other hand, teachers with low self-efficacy levels establish more rigid rules and provide control based on external rewards and punishment (Tschannen in Ozka, 2014). They are more authoritative and have high levels of burnout.

**Impact of teacher's professional development on assessment practices**

Professional development in its sense, refers to skills and knowledge attained for both personal development and career advancement. It encompasses all types of facilitated learning opportunities, ranging from college degrees to formal coursework, conferences and informal learning opportunities situated in practice. Iyunade (2017) defined Teachers' professional development as that component of any educational system concerned with the education and training of teachers to acquire the necessary competencies and skills in teaching for improvement in the quality of teachers in the school system. It is often planned and systemically tailored and applied for the cultivation of those who teach or will teach, particularly but not exclusively in primary and post primary schools. It has been described as intensive and collaborative, ideally incorporating an evaluative stage.

The professional development for teachers is an important component of the quality of education. However, few systems for monitoring and analysing the quality and impact of teacher professional development programmes have been created. The quality of education depends largely on the training of teachers (Bayar, 2014). Therefore, the professional development for teachers is an important component of the quality of education in a country. Countries and regions invest millions of dollars in the professional development of their teachers to improve the quality of education they offer (Bautista & Ortega-Ruíz, 2015; Bayar, 2014).

**Students' Factors Influencing Assessment Practices**

A plethora of studies have been carried out to identify and analyze the range of student factors that influence assessment practices and overall affect students' academic performance in various levels of educational attainment across the world.

According to Ali, Zubair and Fahad (2013), students related factors that affect the academic performance of students include insufficient effort, lack of self-motivation, learning preference, previous and recent academic performance, students' academic attitude and previous school. Udoh (2014) alludes to examination malpractice, poor study habits, peer influence, absenteeism and lack of self-confidence. Newsberger (2023) listed the causes of poor academic performance of students to include drugs, alcohol, crime, psychiatric or severe family problems and students' indiscipline. Absenteeism, study habits, indiscipline and cultism were established by Odumbe (2012) as the major factors contributing to poor academic performance of students.

**Students' motivation and engagement in science learning**

Students' motivation towards science learning has contributed a considerable impact on students' science achievement (Pintrich & Schunk, 2021). The academic achievement, success of the students is important because it is strongly linked to the positive outcome, we value the most students. Researches show that academically successful students will have more employment opportunities than those with less education. Besides, academically successful students are more stable in their employment; more likely to have

**Impact of students' diversity on assessment practices**

Diversity is a fact of life. Diversity is a natural phenomenon and cultural diversity a fact of life. Mankind therefore needs to develop the ability and willingness to understand, acknowledge and embrace cultural diversity. With 374 (some say over 500) ethnic groups who speak over 350 languages, Nigeria's diversity is not in doubt (Ozekhome, 2014; National Institute for Legislative Studies, 2015). A number of studies have confirmed that there is significant relationship between cultural diversity and learning and education. While Barndt (2017) canvasses that multicultural education and learning covers all those theories and practices that help to encourage equitable opportunities for academic attainments, Witsel (2013) argues that even where the teachers and

students have the same cultural orientation, the teaching and learning process is not easy let alone where they are different.

**School and System Factors Influencing Assessment Practices**

**School culture and support for assessment**

School culture is the set of implicit assumptions, beliefs and expectations that drive the activities and behaviours within a school. This includes the unwritten rules about decision-making and the types of achievements that are valued and celebrated.

Within the learning environment are school culture, structure and practices. According to Kaplan et al. (2013), school culture encompasses the shared orientations, values, norms, and practices with which an educational unit are held together, giving it a distinctive identity, and vigorously resist any change from the outside which may want to influence how things are done within the organization.

**Resource availability and accessibility for assessment**

Educational materials are the specially prepared materials intended to be used during the processes of teaching and learning, in other words, when studying specific educational contents and achieving specific educational goals as they are specified in syllabuses. Instructional resources are crucial to teaching and learning processes. Instructional resources are referred to as the resources which both the teachers and pupils use for the purpose of effective teaching and learning, instructional resources are crucial to teaching and learning processes. According to Oni (2014), instructional resources are teachers' strategic factor in organizing and providing education. This is so because they help to elaborate a concept that the teacher could not, without an instructional material. This allows the students to learn more comfortably, as such have positive on their students' academic performance. They consist of books, encyclopedias, atlases, dictionaries, textbooks, etc.; that is, mostly written materials, which can be either printed or available in electronic form (on digital media or on-line). Both printed and electronic educational materials are indispensable in the teaching process. Amoo (2013) observed that availability and utilization of instructional materials will enhance effective teaching and learning activity and when this is so, there is higher educational attainment by students.

**Impact of educational policies on assessment practices**

Education policy is the term used to refer to the principles and policy decisions that influence education, including all the laws that govern the setting up and running of educational institutions. The scholarly study of education policy is known as educational policy analysis. A few impacts of educational policies on assessment practices include:

i Safety in the Learning Environment: Educational policies also influence how safe students feel in their learning environment. The policy can mandate that all schools shall have to

adhere to a certain standard when it comes to both physical safety as well as mental well-being of the students and teachers alike

ii Promote an Active Learning Culture: The policy needs to enable teachers to promote and provide an active culture around sharing knowledge through formal and informal means so that the students can grow their intellect together.

iii Equality and Diversity Inclusion:

iv Maintaining Compliance: Every educational institution is obligated to follow the law of the land, and they will follow the law strictly only if there is strict legal action against non-compliance.

**Implications and Recommendations**

**Implications for teacher professional development**

Professional development empowers teachers with innovative teaching strategies, up-to-date content knowledge, and refined classroom management skills. These enhancements in teaching directly correlate with improved student performance, increased engagement, and a more positive learning environment.

**Recommendations for improving assessment practices in basic education science**

In assessing basic education science students, the following practices can be improved on by science teachers:

i Reflective writing: Give your students journals and ask them to reflect on the day's lesson by writing about what they learned as well as what they found challenging. Encourage them to explain how they might apply the lesson or skill they learned in real life.

ii Engage learners in choral response: A choral response is a quick and easy way to assess your students' understanding of a concept they just learned

iii Entry and exit questions: Give each student a question at the beginning of class to find out what they remember from the previous day's lesson. Then, give them another question at the end of class to see if they understood that day's lesson. Collect all the responses and count how many understood the lesson, partially understood the lesson or didn't understand the lesson.

iv Engage students in Computer survey: Send your students computer-based surveys they can complete on their own time. A variety of online platforms offer free survey tools. You can include short-response questions such as multiple choice or true and false to assess their understanding of the day's or week's lessons. Another benefit of using surveys is you can organize and evaluate responses by student or class and have a record of responses to reference.

## REFERENCES


Adeyegbe, S.O. (2014). Research into STM Curriculum and School Examination in Nigeria. The State of the Art. Science Teachers Association of Nigeria. Proceedings of 45th Annual Conference, 70-79.

Ali, H. Zubair, M. & Fahad, M. (2013). Factors contributing to the students' academic performance: A case study of Islamia University sub-campus, «American Journal of Educational Research», 1 (8), 283-289.

Ates, H., & Saylan, A. (2015). Investigation of pre-service science teachers' academic self-efficacy and academic motivation toward biology. International Journal of Higher Education, 4(3), 90–103.

Bautista, A., & Ortega-Ruíz, R. (2015). Desarrollo profesional docente: Perspectivas y enfoques internacionales [Teaching professional development: International perspectives and approaches]. *Psychology, Society, & Education*, *7*(3), 343–355.

Barndt, J. (2007). Understanding and Dismantling Racism: The Twenty-first Century Challenge to White America. Minneapolis: Fortress Press

Bayar, A. (2014). The components of effective professional development activities in terms of teachers' perspective. *Online Submission*, *6*(2), 319–327.

Enaibe, P. U. (2013). Curriculum Studks 1LIiIr Easy, Warn. Emakome Enterprise.

Enaibe, P. U. (2014). The techniques of teaching and learning, Warri. Emakome Enterprise

Federal Ministry of Education. (2020). *National policy on Education (Revised)*, Lagos: Federal Ministry of Information Printing Division.

Koc, C. (2013). An investigation into elementary school teachers' self–efficacy beliefs and skills for creating constructivist learning environments. Hacettepe University. Journal of Education. Special issue 1: 240 – 255.

Inyang, N. U. (2012). Perspectives of Appropriate Assessment of Cognitive Behaviours in STME: Inaugural Lecture of the University of Uyo

Newsberger, E.H. (2023) Why do students cheat? Retrieved from www.why-do-students-cheat.126.ehn,

Oni, J.O. (2014). Resource and Resource Utilization as Correlates of School Academic Performance. Unpublished Ph.D Thesis, University of Ibadan, Ibadan, Nigeria

Osokoya, I.O. (2016). Formative Assessment: Caveat Emptor. In the Future of Assessment: Shaping teaching and learning (C.A. Dwyer, ed.), New York: Erlbaum.

Ozekhome, M. A. A. (2014). Zoning to Unzone: The Politics of Power and the Power of in Nigeria. Lagos: Mikzek Law Publications Ltd.

Ozkal, N. (2014). Relationships between teachers' creativity fostering behaviours and their self–efficacy beliefs. Education Research and Review, 9 (18) 724 – 733

Pintrich, P.R., & Schunk, D.H. (2021). Motivation in education: Theory, research, and applications (2nd ed.). upper Saddle River: NJ: Prentice Hall.

Sikka, A., Nath, J. L., & Cohen, M. D. (2017). Practicing teachers' beliefs and uses of assessment. International Journal of Case Method Research & Application. XIX (3), 239- 253

Udoh, U.A. (2014). Remote causes and counseling implications of examination malpractice in Nigeria, *Student Pulse Journal*, 3 (10), 1-13.

Odumbe, G.A. (2012). Factors influencing student academic performance in day secondary schools in Migori district, Kenya. An Unpublished M. ED Thesis, Maseno University.

Witsel, M. (2013). Teaching and learning issues in the multicultural classroom, Proceedings of Effective Teaching and Learning Conference, Brisbane, 6-7 November, Griffith University