

Balancing Assessment and Creativity in Basic Science Teaching in Nigerian Schools

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Abstract—The objectives of the Basic Science and Technology curriculum in Nigeria include among other things enabling the learner develop interest in science and technology as well as acquire basic knowledge and skills in science and technology. Science teachers are often faced with a struggle to work on external examination demands on the curriculum and still make science interesting to students. The external examinations in the form of standardized tests place a lot of constriction on the science teacher who has a duty to ensure that students pass these exams and still make science interesting, enabling the students acquire basic knowledge and skills in science. This paper suggests some strategies that will enable the Basic science teacher balance students' assessment and creativity in their Basic science teaching. Such strategies include proper lesson planning, use of a variety of instructional styles, use of hands – on activities, creating assessment rubrics on several contents among others.

Index Terms—assessment, creativity, science teaching

I. INTRODUCTION

Assessment is a critical component of the teaching and learning process. Assessment in science teaching and learning lends itself to various forms to accommodate the cognitive, affective and psychomotor domains. The curriculum of Basic Education in Nigeria is structured for a 9 – year period with Lower Basic Education (Primary 1-3), Middle Basic Education (Primary 4-6) and Upper Basic Education (JSS 1-3). Basic Science and technology is a subject in the 9-year Basic Education Programme. At the lower and middle levels of Basic Education, Introductory technology topics have been introduced while the upper level is left with purely science topics.

The objectives of the new Basic Science and Technology curriculum as identified by "Hamza & Mohammed. [1]" is to enable the learners: 0

- Develop interest in science and technology
- Acquire basic knowledge and skills in science and technology
- Apply scientific and technological knowledge and skills to meet contemporary societal needs
- Take advantage of the numerous career opportunities provided by science and technology
- Become prepared for further studies in science and technology

- Avoid drug abuse and related vices
- Be safety and security conscious.

A basic education certificate examination is taken at the end of the upper basic level (JSS1-3). Assessment of student learning at the end of a teaching cycle according to "Sato & Atkin," [2] is important for teachers to establish how well the students have learned the material, whether they are ready for the next level, whether changes in instruction are necessary and what grades to assign students as well as reporting on students' progress to administration and parents. "Hamza and Mohammed" [1] observed that undue emphasis is placed on examination as an instrument for assessment rather than practical skills. This they pointed out is traceable to the lack of laboratories and workshops, and inadequate personnel and resources.

The basic science curriculum like many science curricula emphasizes the inquiry approach to science teaching. "Igbokwe", [3] pointed out that the recent curriculum reform at the Basic Education level in Nigeria aims at catching students young to create change. Teaching science to catch students young implies that the science teacher should employ creativity in his science teaching and at the same time ensure that the students subjected to the standardized tests at the end of their programme do well. Creativity is defined as mental ability based on cognitive and motivational processes where however an important role is played by inspiration, imagination and intuition "Tronva&Trana. [4]". The creative science teacher focuses on the development of students' creativity as well as their conceptual understanding of science.

II. TEACHER ASSESSMENT PRACTICES

For the assessment of students to adequately encompass the three educational domains of cognitive, affective and psychomotor, a variety of assessment strategies should be employed by the Basic Science Teacher. This variety of assessments is more easily employed when the science teacher is skilled in choosing a range of methods for instruction and a wide range of activities for students to do which evoke critical thinking on the part of students.

Classroom assessment and grading practices have the potential not only to measure and report learning but also promote it, McTighe and O'Connor [5]. The three categories of classroom assessment are the summative

assessment, diagnostic assessment and formative assessment. Summative assessments summarize what students have learned at the end of an instructional segment. Diagnostic assessments sometimes also known as pre-assessments typically precede instruction and are used to check students' prior knowledge and skills levels. Formative assessments occur concurrently with instruction and are ongoing. These ongoing assessments according to Mc Tighe and O' Conner [5] provide specific feedback to teachers and students for the purpose of guiding teaching and to improve learning.

Teacher assessment practices should be guided by principles of good practice for assessing students learning. These principles underlie fundamentally what assessments set out to achieve in instruction that is improving learning.

Teacher assessment practices span summative, diagnostic and formative assessments. However improvement in learning is best fostered when assessment entails a linked series of activities undertaken over time, American Association for Higher Education AAHE. [6] What is important is to monitor progress toward intended goals targeted at students' continuous improvement

It is thus suggested that balancing assessment and creativity in Basic science teaching in Nigeria is a necessity for the science teacher to achieve the aims of Basic Science and Technology.

A. Influence of Assessment on Instruction

The basic science teacher faces the challenge of providing objective data as evidence of classroom assessments. The standardized tests undertaken by students at the end of their educational program determine to a large extent what instructional methods the teacher will adopt. They determine what activities the science teacher gives to students. The teacher tailors his instructions to match the assessment pattern often found in standardized tests. According to Moon, Brighton & Callahan [7] teachers must show evidence that content standards are the focus of the lesson and students are expected to connect the lessons they are taught to the standards. No criteria for including creative or innovative methods that integrate high level thinking skills are mandated. What this implies is that teachers are often limited to the objectives specified in the curriculum and target to present scores or data adjudged to be good grades by the criteria set for standards.

Furthermore the teacher is expected to use objective scores on which to base educational decisions that are fair. For the Basic science teacher to try new ideas in instruction he would consider the time available to bring in creativity in his class. He may be constrained by the expectation to conform to standards and see that his students' performance in standardized exams is rated high. Standards focus on basic skill levels and are rapidly changing the instructional styles of teachers who are moving away from innovative methods to more traditional ones of drill and recitation to ensure high

stakes test scores are raised, Moon, Brighton & Callahan [7]

The Basic science teacher should consciously vary his instructional styles and ensure that the state's standardized tests do not place restriction on what he can do as a science teacher.

III. MAXIMIZING THE BENEFITS OF BALANCING CREATIVITY AND ASSESSMENT.

Science teachers who are creative in science teaching maximize students' potentials in the classroom. One of the numerous benefits of incorporating creativity in the curriculum according to Burke-Adams [8] is that it provides students with opportunities to practice non-conventional modes of thinking that enhance motivation.

Classroom Assessment is a process of collecting and interpreting information to make decisions concerning students. According to Brookhart [9], planning, teaching and assessment are the three interactive components of education of instruction.

The use of varied assessment techniques is a strategy the Basic science teacher can employ to promote creativity in the classroom. For instance assigning projects to students that will involve assessments of the students methods in designing the project and the product will allow for students creativity. Broadening the assessment techniques employed by the science teacher will enhance the creativity as well as the curiosity of students.

The major challenges facing the classroom teacher in assessment according to Lumadi [10] are policy interpretation, assessment planning, implementation of assessment, the use of a variety of methods in assessment and time for assessment

To maximize the benefits of balancing creativity and assessment, the Basic science teacher should be skilled and competent in the use of varied assessment strategies. The standards for teacher competence in educational assessment of students as itemized by in standards for teacher competence in educational assessment of students include that the teachers should be skilled in [11]

1. Choosing assessment methods appropriate for instructional decisions
2. Developing assessment methods appropriate for instructional decisions.
3. Administering, scoring and interpreting the results of both externally produced and teacher produced assessment methods.
4. Using assessment results when making decisions about individual students, planning, teaching, developing curriculum, and school improvement.
5. Developing valid pupil grading procedures which use pupil assessments
6. Communicating assessment results to students, parents, other lay audience, and other educators.
7. Recognizing unethical, illegal, and otherwise inappropriate assessment methods and uses of assessment information.

IV. BALANCING CREATIVITY AND ASSESSMENT: SUGGESTED STRATEGIES FOR THE BASIC SCIENCE TEACHER

A. Lesson Planning

The extent to which the aim of the UBE curriculum is achieved is the extent to which the Basic science teacher carefully plans his lessons. The workability of any curriculum, according to “Hamza and Mohammed[1]”, depends on its effective delivery which involves the learner, the teacher, the resources, the methods of teaching and evolution (sic) as well as the physical and psychological environment which must be adequate and conducive for learning to take place. The Basic science teacher is usually constrained by time and resources. This implies that the teacher should properly plan his lessons and organize them in a manner that he can do much within the available time. The teacher has to organize his work plan with clear description of students’ activities.

B. Use of a Variety of Instructional Styles

The general saying is that teachers are likely to teach the way they have been taught. The problem of science teaching in an authoritative presentation of science content is a problem the science teacher has to battle with. This is because many teachers went through a science education programme in which the teacher was taught science in an authoritative manner. There is often the temptation of using the lecture method and total reliance on textbooks without varying the manner in which these materials are presented. It is suggested that teachers vary their instructional style and apply problem – solving instructional methods. Teachers should expose students to new technologies in learning like the internet and help them develop ideas on projects they can work on. While this will expose the teacher to varied assessment strategies it will also help students understand what they do.

C. Use of Hands–On Activities

The basic science teacher should employ hands – on activities for students to enhance students’ understanding of science concepts and principles. The teacher should encourage the students to be active in the class and discourage rote learning. Assessment can be done on different domains and the science class becomes very interesting to students. The use of hands – on activities will appeal to the students’ natural curiosity.

D. Use of Assessment Rubrics on Different Instructional Content

The basic science teacher can create a grading rubric for the assessment of different curriculum contents. This rubric should list what the science teacher will be looking for with a clear explanation of what the student is expected to do and the scoring to match that. Creating a rubric may take the teacher some time but it will serve as a guide to the basic science teacher in what the students are being assessed on. The assessment rubric has the advantage of providing information to the teacher on the extent of students’ mastery of specific concepts. The

teacher can re-teach concepts that the students have not mastered using other instructional methods.

V. CONCLUSION

The basic science teacher is faced with the challenge of ensuring that his students pass external examination in the form of standardized tests and at the same make his science class interesting. The standardized tests also pose a challenge of limiting the teacher to instructional and assessment techniques which he can apply. It is the conclusion of this paper that though the science teacher is constrained, he should carefully plan his lessons, apply a variety of instructional strategies, engage students in hands – on activities and create assessment rubrics that will provide a clearer picture of what the students have mastered. The Basic science teacher should have in mind that monitoring students ‘progress is more critical than waiting till the end of a teaching period to summarize what the students have learned. When this is done the Basic science teacher would have balanced his assessment and creative science teaching.

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