JURNAL UPI

Indonesian Journal of Teaching in Science

IJOTIS

Journal homepage: http://ejournal.upi.edu/index.php/ IJOTIS/

School-Based Assessment in Secondary School Science Learning: Teachers' Perspective

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ABSTRACT

The study established the teachers' viewpoints on school-based assessment of secondary school science instruction in Anambra State, Nigeria. The research used a descriptive survey methodology. The 158 science teachers employed by the 32 public secondary schools in the Onitsha Education Zone of Anambra State made up the population of the study. Two of the three Local Government Areas of the Zone were chosen using the purposeful sampling technique, and the sample size was all 158 science teachers. "Questionnaire on Teachers Perception of the Use of Different Types of School Based Assessment in Teaching and Learning of Science in Secondary Schools" was a data collection tool created by researchers. It was validated, and Cronbach's alpha formula was used to determine its overall reliability, which was 0.71. For data analysis, mean and standard deviation were employed. According to the study's conclusions, science teachers in secondary schools use formative assessment in the teaching and learning of science courses to a moderate extent. Additionally, summative assessment is highly utilized in the teaching and learning of science subjects in secondary schools by science teachers, as opposed to diagnostic assessment, which is mostly underutilized (low extent). As a result, it was suggested, among other things, that science teachers be encouraged to utilize the many forms of school-based assessment for efficient science teaching and learning.

ARTICLE INFO

Article History:
Submitted/Received 23 Nov 2023
First Revised 22 Dec 2023
Accepted 10 Feb 2024
First Available online 15 Feb 2024
Publication Date 01 Mar 2024

Keyword:
Learning,
School-based assessment,
Science,
Teachers.

1. INTRODUCTION

Science subjects contain activities that are carried out in both the classrooms and laboratories towards attaining most of the educational goals. This can be accomplished through effective school-based assessment (SBA). SBA, therefore, can be said to be the fulcrum of education evaluation which helps students achieve the needed cognitive, affective, and psychomotor skills in science learning. Science through technology has become known as one of the most significant fields of study that has enhanced man's life.

Also, the applications of scientific knowledge have influenced how man relates, created environmental awareness of natural resources, and enhanced disease control and eradication towards a better life. Science is a body of knowledge acquired through experimentation and investigation of events in nature. It is a systematic inquiry into the universe en route to solving real-life problems and the effective acquisition of the needed knowledge, attitude, and skills. Science is a way of thinking in pursuit of understanding and investigating nature. In science learning, understanding, and investigating nature cannot be feasible without the appropriate assessment that SBA provides.

SBA according to Mkpae and Obowu (2017) "is an effective classroom assessment which requires skills and practices as students react to achieve their immediate objectives, it is the basic need of the teacher to improve the standard of learning because they have a greater responsibility to design quality assessment that aligns with the students learning outcome", SBA is defined "as a comprehensive, systematic, continuous, diagnostic, and integrative teacher-directed assessment procedure".

It provides the necessary opportunity for the teachers to monitor the students and provide the necessary feedback on the learning process. In Nigeria, SBA policy aims to abolish the first school leaving certificate which is based on the results of a single final examination but introduces a primary school leaving certificate which will be issued by the students' school and must be based on the overall assessment of the students. Furthermore, it has been included as part of the requirement for any certificate examination in Nigeria to compliment scores of prospective students for the award of certificates.

SBA is designed to reduce the over-dependence on data (grades and scores) obtained through central examinations in getting information about students in the school system. SBA is expected to enhance the meaningfulness of assessment where the focus is more on students' development and growth in learning rather than merely on their scores or grades (Md-Ali *et al*., 2015).

SBA "is comprehensive, systematic, continuous, diagnostic and integrative teacher-directed assessment procedure". It effectively uses instruments such as interviews, assignments, projects, tests, and questionnaires and involves the three domains of leaning-cognitive, affective, and psychomotor. SBA is a complex form of assessment that co-opts other forms of assessment to provide the needed information for making efficient educational decisions. Moreover, Aduloju *et al.* (2016) opined that SBA could be formative, diagnostic, summative, performance, authentic, and so on. This study specifically concerns itself with summative, formative, and diagnostic assessment.

In summative assessment, only the past progress of the students is shown, and teachers are the sole authority that does not test their practices. Ahmed *et al*. (2019) defined summative assessment as a process in which students' achievements are recorded on a numerical scale with the major aim of taking stock of how students have achieved their objectives while formative assessment is the process in which teachers identify learners' needs by monitoring, diagnosis, action and invariably shapes students learning as well as

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 2776-6101 e- ISSN 2776-6152

informs teachers about how to appropriately adjust their teachings. Hence, it involves both the learner's and teacher's classroom practices. Formative assessment involves the process of the learners in the course of learning. Its major aim is to provide constant feedback during instruction to both the teachers and learners.

According to Shim *et al*. (2017) and Zhao (2013), diagnostic assessment refers to the prelude type of assessment where the strengths and weaknesses of students in any subject during the learning process are detected. This means that information about students' misconceptions, skills, and prior knowledge is provided, in addition to necessary feedback and instructional needs. It identifies specific problems each student has in each subject of learning.

Therefore, SBA provides teachers' overall judgment of students' academic work and performance by systematic collection of grades or marks (Yusuf, 2014). For this reason, Ahmed and Williams (2014) stated that the features of SBA "include a wide range of assessment tasks and skills, flexibility in assessment form (written or oral), and the use of open-ended questions" some empirical studies have been done on SBA and some of the findings discussed below. Oribhabor and Aituariagbon (2019) affirmed that SBA was introduced at the lower, middle, and upper basic levels of Nigerian education to enhance the effectiveness and change in school assessment. In the same vein, Oribhabor and Aituariagbon (2019) found that teachers' level of awareness, and classroom management influence the effective implementation of SBA in schools in Benin City, Edo State, Nigeria.

The study suggested effective monitoring of educational policy implementation and timely in-service training for all teachers in secondary schools of learning. Hence, SBA allows teachers to evaluate skills and knowledge that cannot be tested using external examinations. Some of the challenges facing SBA are the limitation of teachers to a framework, lack of teachers' guidance, and students believing that SBA is a burden to their learning process.

In a study done by Longjohn and Sililayefa (2019) it was found that public school teachers utilize SBA to a low extent, while Mahmud *et al*. (2020) stated that the overall practice of SBA among teachers was strong. The use of formative assessment is at a low level because of the teachers' difficulty in integrating SBA into the teaching and learning process

Even though SBA has been implemented in Nigeria since the year 1999, so many inadequacies still exist. Especially, concerning science teachers' workloads, overloaded curriculum, lack of facilities for science learning, and according to Odukwe and Nwafor (2022) and Ezeudu *et al*. (2019) the consistent use of lecture method in science teaching. Hence, the present education system in Nigeria is criticized for being examination-oriented, the researchers therefore, decided to explore the extent to which three modes of SBA are used in teaching and learning science subjects in Anambra State, Nigeria. The following research questions guided the study:

(i) To what extent is formative assessment used in the teaching and learning of science subjects in secondary schools?
(ii) To what extent is summative assessment used in teaching and learning science subjects in secondary schools?
(iii) What is the extent to which diagnostic assessment is used in teaching and learning science subjects in secondary schools?.

2. METHOD

A descriptive survey research design was used for this study. All of the science instructors in the 32 public secondary schools in Anambra State's Onitsha Education Zone made up the study's population. Two of the Zone's three Local Government Areas, Onitsha North and

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p-ISSN 2776-6101 e-ISSN 2776-6152

Onitsha South, were chosen using a purposeful sampling technique. All 158 science teachers in the targeted areas made up the sample size.

The "Questionnaire on Teachers' Perception of the Use of Different Types of SBA in Teaching and Learning of Science in Secondary Schools" was a data-gathering tool created by the researchers. The instrument was made up of the clusters A, B, and C. The instrument consists of a total of 15 items, each of which is rated on a four-point Likert scale from Strongly Agree (SA) to 4 points, Agree (A) to 3 points, Disagree (D) to 2 points, and Strongly Disagree (SD) to 1 point. Each cluster addressed a study issue and contained five items per cluster.

The instrument was validated by three specialists from the Department of Science Education at Nnamdi Azikiwe University in Awka, Anambra State. Using the Cronbach alpha formula, the reliability indices for clusters A, B, and C were calculated to be 0.66, 0.88, and 0.85, respectively; and an overall reliability index of 0.71 was also obtained To guarantee a 100% return of the copies supplied, the researchers physically administered the questionnaire to the science teachers. Mean and standard deviation were used to provide answers to the research questions.

The real limit of numbers based on the following mean scores was used to determine the extent to which the various assessment types were used in the teaching and learning of science subjects in secondary schools: low extent (2.49 and below); moderate extent (2.50-3.49); and high extent (3.50-4.00).

3. RESULTS AND DISCUSSION

3.1. Research Question One: To What Extent is Formative Assessment used in the Teaching and Learning of Science Subjects in Secondary Schools?

The results in **Table 1** reveal that items 1, 2, 3, 4, and 5 were to a moderate extent, with mean scores of 3.47, 3.35, 3.28, 3.16, and 3.30, respectively, as they fell within the mean range of 2.50-3.49. Additionally, the overall mean score and standard deviation were 3.31 and 0.42, respectively. This suggests that secondary school science teachers utilize formative assessment in the teaching and learning of science courses to a moderate extent.

Table 1. Mean and standard deviation scores of the extent to which formative assessment is used in the teaching and learning of science subjects in secondary schools**.**

S/n	Item	Mean	SD	Decision
1.	I use formative assessment to support/monitor all the normal activity in the science classroom	3.47	0.62	Moderate Extent
2.	I use formative assessment to know what ideas students understand in the cause of teaching and learning of science subjects	3.35	0.66	Moderate Extent
3.	I use immediate feedback from the students in teaching and learning of science subjects	3.28	0.64	Moderate Extent
4.	I use formative assessment as feedback for judging the quality of student's performance in science subjects	3.16	0.80	Moderate Extent
5.	I use formative assessment for effective ongoing evaluation and remedy	3.30	0.73	Moderate Extent
Overall mean and Standard Deviation		**3.31**	**0.42**	**Moderate Extent**

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 2776-6101 e- ISSN 2776-6152

3.2. Research Question Two: To what Extent is Summative Assessment used in Teaching and Learning Science Subjects in Secondary Schools?

Since they all lie within the mean range of 3.50–4.00, the results in **Table 2** indicate that all of the items 6–10 were to a high extent. Additionally, 3.82 was found to be the overall mean and 0.18 was found to be the standard deviation. This suggests that summative assessment has been used to a high extent in the teaching and learning of science subjects in secondary schools.

Table 2. Mean and standard deviation scores of the extent to which summative assessment is used in the teaching and learning of science subjects in secondary schools.

S/n	Item	Mean	SD	Decision
6.	I give the test to the students at the end of the lesson	3.91	0.29	High Extent
7.	I compile the achievements of the students in the class as evidence of their performance	3.89	0.31	High Extent
8.	I assess the students based on what they learned on a particular topic	3.82	0.39	High Extent
9.	I assess my students as a group and as an individual using a numerical scale	3.71	0.46	High Extent
10.	I use summative assessment to know students' success or failure in their learning process based on a numerical scale	3.78	0.42	High Extent
	Overall Mean and Standard Deviation	**3.82**	**0.18**	**High Extent**

3.3. Research Question Three: What is the Extent to Which Diagnostic Assessment is Used in Teaching and Learning Science Subjects in Secondary Schools?

The results in **Table 3** demonstrate that all items 11, 12, 13, 14, and 15 were to a low extent because their mean scores were 2.49 and below. Additionally, the overall mean score and standard deviation were 1.92 and 0.62, respectively. This suggests that science teachers in secondary schools in Onitsha North Local Government Area of Anambra State use diagnostic assessment in the teaching and learning of science subjects to a low extent.

Table 3. Mean and standard deviation scores of the extent to which diagnostic assessment is used in the teaching and learning of science subjects in secondary schools.

S/N	Item	Mean	SD	Decision
11.	I use diagnostic assessment to find out student's prior knowledge of a topic	2.16	0.95	Low Extent
12.	I use diagnostic assessment to motivate students to seek accurate information and practice in the learning of science subjects	1.77	0.81	Low Extent
13.	I engage in class discussions to decide what the students can do and what they might be ready for next	2.03	0.74	Low Extent
14.	I point out the gap in students' reasoning and misconceptions in the learning of science subjects	1.99	0.80	Low Extent
15.	I use diagnostic assessment to ensure that the students understand the value of a lesson, module, or entire course in the learning of science subjects after identifying their strengths and weakness	1.63	0.62	Low Extent
	Overall mean and Standard Deviation	**1.92**	**0.62**	**Low Extent**

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p-ISSN 2776-6101 e-ISSN 2776-6152

The findings of the study revealed that secondary school science teachers utilize formative assessment in the teaching and learning of science subjects to a moderate extent. The finding is supported by Mahmud *et al*. (2020) who even asserted a high practice of SBA among the teachers and affirmed that some formative assessment items are practiced at a moderate level. This is against the findings that the use of formative assessment is at a low level as teachers find it difficult to integrate it into the teaching and learning process. Also, the finding is against that current assessment practices are more focused on formative assessment than other types of SBA.

Moreover, the findings showed that summative assessment has been used to a high extent in the teaching and learning of science subjects in secondary schools. This finding aligns with that of Mahmud *et al*. (2020) who stated the overall practice of SBA among teachers was strong. Also, the finding arraign with that of Iddrisu in University of Cape Coast, Ghana found a high usage/practice and knowledge of SBA among primary school teachers.

It can also be deduced from the findings that science teachers in secondary schools in Onitsha North Local Government Area of Anambra State use diagnostic assessment in the teaching and learning of science subjects to a low extent. This is in agreement with the findings of Longjohn and Sililayefa (2019) who stated that public school teachers utilize SBA to a low extent.

Similarly, Longjohn and Sililayefa (2019) suggested the equipping of teachers with the necessary knowledge and the provision of materials and tools for the implementation of SBA. Moreover, Imasuen and Iyamu (2021) carried out a study on the perception and application of SBA in selected public junior secondary schools in Edo State, Nigeria, and found out that teachers have a good perception of school-based assessment, and their application was to a low degree which aligns with the findings of this study.

4. CONCLUSION

The researchers concluded that secondary school science teachers do not effectively utilize all of the various methods of evaluation for teaching and studying science courses. The usage of summative and diagnostic assessments is moderate and low, respectively, except for summative assessment, which is employed extensively. The researchers made the following recommendations in light of their findings:

(i) Teachers should be encouraged to utilize the various forms of school-based evaluation in the teaching and learning of science courses.
(ii) To educate teachers on the many school-based evaluation kinds in schools, conferences, and seminars should be arranged by the government and school administrations.
(iii) The cumulative results of the various assessment kinds used in the teaching and learning process should be used to determine a student's final grade in any subject.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 2776-6101 e- ISSN 2776-6152

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DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 2776-6101 e- ISSN 2776-6152