

APPRAISAL OF SECONDARY SCHOOL STUDENTS SELF-ASSESSMENT PRACTICES FOR SCIENCE SUBJECTS IN ONITSHA EDUCATION ZONE

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Abstract

This study is concerned with the appraisal of secondary school students' self-assessment practices for science subjects in Onitsha education zone. Four research questions and one hypothesis guided the study. The study employed the descriptive survey research design. The population for the study comprised all the senior secondary school science students in Onitsha Education Zone of Anambra state, Nigeria. Senior Secondary School Self-Assessment Scale for Science Subjects (S^7) was used to collect data for the study. The validity of S^7 was done by experts from Department of Education Foundations, NnamdiAzikiwe University, Awka and its reliability determined using Cronbach Alpha to be 0.86. Data from the study was analysed using mean, standard deviation, frequency count, percentage and weighted response average and analysis of variance. The study showed among others that students engage in few self-assessment practices which they seldom apply in science subject. The study found also that secondary school students have very low competency level in the use of self-assessment and did not differ significantly in such usage across educational levels. It was recommended that secondary school science teachers should during the teaching and learning process, model for the students the self-assessment practices that could help them to make learning more meaningful.

Keywords: Appraisal, Self-assessment, science, learning, secondary school

Introduction

Science education, therefore, is not just a segment of the curriculum but a cornerstone of a nation's future. Education, a cornerstone of societal progress, is constantly evolving to meet the demands of our ever-changing world. Within this vast arena, self-assessment

emerges as a crucial skill, acting as a compass for learners to navigate their educational journey. This skill becomes particularly pivotal when discussing science subjects- a focal point of this research.

Science has undeniably shaped the contours of modern society. In its multifaceted forms, science stands as a pillar of modern civilization. It permeates every aspect of our daily lives, from the technology we use to the medical advancements that prolong our lifespan. Beyond its practical applications, science fuels societal progress, pushing the boundaries of what we know and reshaping our understanding of the world (Rull, 2014; Miedema, 2021). As nations race towards innovation and problem-solving in a rapidly evolving global landscape, the relevance of science becomes even more pronounced. They stimulate critical thinking, cultivate curiosity, and instil a sense of wonder about the universe and our place within it. As the world increasingly leans into technology and scientific research to address global challenges, from climate change to pandemics, a robust understanding of science becomes inevitable.

However, the very nature of science subjects and the understanding of its ideas present unique challenges for students (Hadzigeorgiou,&Schulz,(2019). Unlike many other subjects that rely predominantly on rote learning or memorization, science emphasizes inquiry, experimentation, and logical reasoning. It demands not only the absorption of facts but also the ability to apply concepts, think critically, and derive conclusions from observations. This dynamic interplay of knowledge acquisition and application makes science both exhilarating and, at times, daunting for learners, demanding constant self appraisal. Students need the act of learning to learn, part of which entails, the ability to quiz themselves. This also brings us to a pressing concern of students' performance in science subjects. There exists a dichotomy between the undeniable importance of science and how students fare in it. Despite the critical role of science in modern society, many students grapple with its intricate concepts, often resulting in subpar performance. The trends in performance among the various science subjects reveal some fluctuations (Akinodi,2020; Olojo, Akinwumi, & Olofin; 2022). Such performance trends necessitate a closer examination of pedagogical approaches, learning environments, and tools like self-assessment, which could bridge the gap between the inherent challenges of science subjects and students' mastery over them.

Self Assessment and Students' Learning

The examination of one's own actions, attitude, performance, or abilities is known as self-assessment. Self assessment is a process by which the students gather information about and reflect on their own learning (Sharma, Jain, Gupta, Garg, Batta and Dhir , 2016). It is a procedure whereby a person reviews his or her own areas of strength and weakness as well as their performance in light of specific criteria (Yan, 2016). It is not just about identifying where you are at the present, but also about charting a course for where you want to be. To do self assessment, “students collect information about their own performance, evaluate and reflect on the quality of their learning process and outcomes according to selected criteria to identify their personal strengths and weaknesses” (Yan& Brown, 2016 : 1248). Specifically, academic self assessment relates to evaluations of one’s understanding of and mastery of learning objectives and abilities (Andrade, 2019).

Self assessment has several benefits to the students. It empowers the students to take the appropriate activities and remedial measures in accordance with their pace or study

methodology (James and Jessica, 2022). It helps students to develop critical thinking skills, and increase their interest and motivational levels (Sharma et al, 2016). Equally it plays important role in self regulated learning, encompasses feedback seeking, enhances self-reflection, metacognitive skills as well as the identification of the students strengths and weaknesses for the purpose of improvement (Brown, Andrade, & Chen, 2015; Yan & Brown, 2016).Self-assessment which entails both self-reflection and judgement is an effective way to improve a student's educational experience. It is crucial for instructing students on how to learn and what they can do to enhance their learning outcomes, in addition to what they should learn (Admiraal, Huisman& Pilli, 2015). These relevances are mostly observed when self assessment is used formatively with training and not for the purpose of summative judgements and awarding of marks (Andrade, 2019).The goal of self-evaluation is to enable the person to understand the scope of his abilities and to enhance them without the assistance of a performance appraiser. Self-evaluation can help students develop critical thinking abilities for analyzing their own work, which will improve their academic performance and raise their interest and motivation in their studies (Balderas &Cuamatzi, 2018).

Studies (Raajeev, Naveenta, Sonia, Meenal& Shashi, 2016; Yan, Wang, Boud& Lao, 2021; Nyla & Muhammad, 2021) have shown that there was significant improvement in academic performance after the process of self-assessment was observed. The importance of self-assessment notwithstanding, Andrade (2019) who conducted a critical review of research on student self-assessment carried out largely between 2013 and 2018 reported that students do practice self-assessment skills with competency. Andrade noted weak and insignificant correlation between students' assessment of self and teachers' assessment on the subject. The understanding as Butler (2018) suggested is that students assess themselves subjectively and with some level of sentiments resulting in lack of objectivity which is a key feature in science learning.

The lack of proper self-assessment is common among Nigerian secondary school students. Studies probing into self-assessment of students with respect to the proportion of students that have self-assessment competency, extent of practice and difference in self-assessment across educational levels is not filled to satisfaction in literature. There is therefore the need to determine the self-assessment practices among secondary school students, the level of practice, competency in the practice of self-assessment and differences across students' demographic variables like educational level.

Purpose of the Study

The main purpose of the study was to appraise senior secondary school students' self-assessment practices for science subjects. Objectively, the study sought to:

1. Identify some of the self-assessment practices used by senior secondary school students for science subjects.
2. Determine the level to which secondary school students apply self-assessment practices for science subjects.
3. Ascertain the proportion of senior secondary school students at different self-assessment competence levels.
4. Examine the influence [of](#) educational level on the self-assessment competence levels of senior secondary school students.

Research Questions

The following research questions guided the study:

1. What are the self-assessment practices used by senior secondary school students for science subjects?
2. What is the level to which senior secondary school students apply self-assessment practices for science subjects?
3. What proportion of senior secondary school students are at the different self-assessment competence levels?
4. What is the difference between the mean self-assessment competences of senior secondary school students based on level of education?

Hypotheses

1. There is no significant difference between the mean self-assessment competences of senior secondary school students based on level of education.

Methods

This study adopted the descriptive survey design. The population of the study comprised senior secondary school students in Onitsha Education Zone of Anambra state. The sample for the study was 400 students obtained using a multi-faceted sampling procedure. First schools were stratified according to the local government areas they are situated. Disproportionate stratified random sampling was used to select 400 senior secondary school students from senior school year one (SSI), year two (SSII) and year three (SS3) who are offering chemistry, physics and biology.

The instrument for data collection was a researcher designed self-assessment scale titled 'Senior Secondary School Self-Assessment Scale for Science Subjects (S⁷). The scale had two sections namely section A and section B. Section A was designed to generate demographic information on the respondents such as their level of education (SS1, SS2 or SS3), subjects offered and gender. Section B contained 10 items on some of the self-assessment practices gathered from literature that are used by students for science study. The scale was designed on a four point likert scale ranging from Very Often (VO), Often (O), Seldom (SE) and Not at all (NA). The instruments were validated by lecturers from the Department of Educational Foundations (Measurement and Evaluation), NnamdiAzikiwe University, Awka. The reliability of the instrument was determined using Cronbach Alpha to be 0.86.

The instrument was administered to the student face to face and collected on the spot after inspection to ensure that all items were responded to. The school science teachers were used as research assistants in the schools visited. The research questions were analysed using descriptive statistics (mean, standard deviation, frequency count, percentage and weighted response average) while the hypothesis was tested at 0.05 level of significance using Analysis of Variance (ANOVA). The criteria used to determine the items to which the students agreed or disagreed to, was that: items with mean equal to and above the cut-off mean of 2.5 indicated agreement whereas item mean below 2.5 indicated disagreement. To determine the level of application of students' self-assessment practices, the following criteria were used to judge the grand mean which is the mean of all item means: grand mean within the range of

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0.50-1.45 implied that they do not apply the assessment practices at all, 1.50 – 2.45 implied seldom application level, 2.50-3.45 implied that students often applied self-assessment practices for science subjects while 3.50 – 4.00 implied that application of self-assessment practices was very often.

The level of self-assessment competence was determined by multiplying the mean of the item weights with the no of items to get the mid-point of 25. Therefore, summated scores on all items above 25 indicated high self-assessment competence whereas summated scores below 25 indicated low level of self-assessment competence. However, for the purpose of clarity, the midpoints from centre of scores were determined for the low and high competency levels to get other ratings. Thus, range of summated scores with 10.00-17.45 indicated very low self-assessment competence level, 17.50-24.45 indicated low self-assessment competence level, 25.00-32.45 indicated high self-assessment competence level and 32.50-40.00 indicated very high self-assessment competence level. The decision rule for testing the null hypothesis was that a Pvalue that is less than 0.05 was rejected and those equal to or above 0.05 was accepted.

Results

Research Question 1: What are the self-assessment practices used by senior secondary school students for science subjects?

Table 1: Mean and Standard Deviation of Senior Secondary School Students' Self-assessment practices for Science subjects

S/N	Items	$\bar{x}$	SD	Remarks
1	I study what was taught in school the same day it was taught to ensure I understood it	1.92	0.92	Disagree
2	I write down a personal summary of what I have learnt	2.05	0.88	Disagree
3	I always look for and solve related questions to what I have read	1.67	0.81	Disagree
4	I compare the steps to solutions of problems I have solved to that given in textbooks	3.18	0.63	Agree
5	I critically examine the scheme of work to ensure that I have learnt all I am supposed to know	1.88	0.78	Disagree
6	I often reflect on what I have learnt, what I do not know and what more I need to learn	3.21	0.57	Agree
7	Sometimes, I give my solved questions exercise book to my classmates to examine me and give me corrections	2.63	0.93	Agree
8	I try to set likely examination questions for myself and answer them	2.22	0.86	Disagree
9	I always grade myself after attempting a question using the marking schemes available in textbooks	2.83	0.79	Agree
10	I consult past external examination questions to solve related questions within a specified time	1.39	1.01	Disagree
Grand Mean		2.30		

Table 1 shows that, whereas the boundary mean is 2.5, only four (4) items out of the ten (10) items have mean of 2.5 and above. The implication is that secondary school students agreed

that they use the self-assessment practices reflected in items 4, 6, 7 and 9. On the other hands, students disagree that they do not use the self-assessment practices captured in the remaining six items. It means therefore, that students have not applied majority of the self-assessment practices outlined in Table 1 for their self-evaluation in science subjects.

Research Question 2: What is the level to which senior secondary school students apply self-assessment practices for science subjects?

Table 1 also shows that the grand mean is 2.30 which fall between the ranges of scores 1.50 – 2.45. This implies that senior secondary school students seldom apply the self-assessment practices for science study.

Research Question 3: What proportion of senior secondary school students are at the different self-assessment competence levels?

Table 2: Percentage of Senior Secondary School Students at Different Self-Assessment Competence Levels

S/N	Level Self-assessment competence	Ratings	N	%
1	10.00-17.45	Very low	187	46.75
2	17.50-24.45	Low	103	25.75
3	25.00-32.45	High	69	17.25
4	32.50-40.00	Very High	41	10.25

Table 2 shows that 187 students representing 46.75% of the students have very low self-assessment competence level, while 103 students representing 25.75% have low self-assessment competence level, with 69 students representing 17.25% having high competence level where 41 students representing 10.25% have very high self-assessment competence level. The implication is that majority of the students have a very low level of self-assessment competency

Research Question 4: What is the difference between the mean self-assessment competences of senior secondary school students based on level of education?

Table 3: Mean Self-Assessment Scores of Senior Secondary School Students based on Educational Level

Educational Level	N	$\bar{x}$	SD
SSI	177	27.51	8.85
SSII	183	26.74	9.22
SSIII	40	29.65	6.64

Table 3 shows that senior secondary school three students (SSIII) have a mean self-assessment score of 29.65, while those is SSII have a mean score of 26.74 with those in SSI having a mean score of 27.51. This implies that students in SSIII have a higher self-assessment competence than those in SSII and SSI whereas those in SSI have a higher self-assessment competence than those in SSII. Again, Table 3 shows that SSIII students have a more homogeneous set of scores than those is SSII and SSI. The implication is that students in SSIII have closely related self-assessment competency than those students in other educational levels.

Hypothesis 1: There is no significant difference between the mean self-assessment competences of senior secondary school students based on level of education.

Table 4: ANOVA on significance of Difference between the Mean Self-Assessment Scores of Secondary Schools Students based on Educational Level

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	283.231	2	141.616	1.812	.165
Within Groups	31026.266	397	78.152		
Total	31309.497	399			

Table 4 shows that there was no significant difference between the mean self-assessment scores of secondary school students based on educational level, since, at 0.05 level of significance, $F(2, 397) = 1.812$, $P > 0.05$. The null hypothesis was therefore accepted. Thus, there is no significant difference between the mean self-assessment competences of senior secondary school students based on level of education.

Discussion

The study showed that students practice such assessment techniques as: comparing the steps to solutions of problems solved to that given in textbooks; reflecting on what was learnt, what is not know and what more needs to be learnt; giving solved questions in exercise books to classmates to examine and give corrections; and grading oneself after attempting a question using the marking schemes available in textbooks. Although these self-assessment practices are necessary, they are inadequate for proper learning of science subjects like chemistry, physics and biology. The lack of adequate assessment practices among senior secondary school students may be attributed to the fact that student have very poor study habits as self-assessment is one of the core features of a good study habit.

In Nigeria, a lot have happened that has made students place the value of education at the verge of a precipice. The incessant strike actions of teachers, severe disruption of academic activities and calendar due to insecurity and health concerns and poor employment of school graduate have all been adduced to affect the academic system and students. Students therefore, seeing no value does not set academic goals for themselves any longer. There is also a serious lack of motivation to learn, much less the need for self-assessment of what is learnt. Again, given the burden of hardship in the country, a lot of the students get home to support their parents and in the long run, relegated the time for personal studies to oblivion. School owned by private educational stakeholders have also made the matter worse by having lesson periods that elongate to the evening at which time the students will not have any strength to study at home. Over time, secondary school students learnt to abandon their studies at home which diminish any good study habit along with any self-assessment skills and practices they have and dwindled the interest to acquire more.

Another factor that is implicated for the very low level competency self-assessment and its seldom application by secondary school students is the teaching approach adopted by most science teachers. Secondary school teacher often use teacher-centred approach which gives the students little of no chance of actively participating in the process. Approaches where teacher can question the students, incite class interaction or group study affords students the opportunity for frequent self-assessment. The findings of the study is closer to

the findings of Ogbu and Ugwu (2020) that majority of the students have low self-assessment practices and competence in Mathematics; and that there was no significant difference in the mean self-assessment practices of male and female students. The findings of the study do not lend credence to the findings of Yan (2016) who reported that senior secondary school students had lower mean score on self-directed feedback seeking and self-reflection as compared to junior secondary school students. The findings of the study are at contrast with the findings of Ahmad (2016) that a significant difference exists between students' self-assessment of themselves as compared to teachers' assessment.

Conclusion

The conclusion drawn from the study is that senior secondary school students seldom practice a few self-assessment strategies and they have very low competency level for self-assessment irrespective of their educational level. Senior secondary school students therefore lack the proper self-assessment practices needed for successful study of science subjects.

Recommendation

The following recommendations were made based on the findings and conclusion of the study:

1. Occasional orientation programmes should be arranged for senior secondary school students to acquaint them with the techniques and strategies for self-assessment that are most proper for science subject and to improve academic achievement.
2. Secondary school science teachers should during the teaching and learning process, model for the students the self-assessment practices that could help them to make learning more meaningful. They can do this through the use of questioning techniques, metacognitive instructional strategies and collaborative learning evaluations.

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