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An Investigation of Students' Perception of Assessment for Learning in Integrated Science: A Case Study of Potsin T. I. Ahmadiyya Senior High School

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ABSTRACT

This study sought to investigate students' perceptions of assessment for learning and the teaching strategies teachers employ in teaching integrated science. The students were sampled using stratified sampling techniques. The sample for this study consisted of 215 senior high school third-year students. Students' perceptions about assessment for learning were checked using Assessments Experience Questionnaires. The questionnaires were analyzed using descriptive statistics. The study found that students have a positive perception of assessment for learning. However, it emerged from the study that students are not assessed adequately in integrated science as prescribed in the science syllabus. Per the responses from the students, the teacher-centered approach seemed to dominate the teaching of integrated science instead of the student-centered approach as prescribed in the science syllabus. It is recommended that there should be proper supervision to ensure that students are well-assessed during the teaching and learning of integrated science. Again, this study for teaching integrated science implies that a specific teaching method (student-centered) or approach should be prescribed in the integrated science curriculum for teachers to use to improve students' academic success in integrated science.

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1. INTRODUCTION

Assessment is considered one of the essential educational tools for determining students' final learning outcomes at the West Africa Secondary School Certification Examination (WASSCE), which usually occurs through summative assessment [1]. However, Ghana education service and teachers have recently broadened their assessment scope to include students' learning outcomes at the end of the semester or WASSCE to

determine students' learning outcomes and improve learning through classroom-based assessment and instruction modification [2]. This is considered an assessment for learning, and it seeks to improve the quality of teaching by utilizing the results of assessments. To this end, assessment has always been a crucial component of teaching and learning. It is a vital component of school life for various educational stakeholders, including parents, educational institutions at all levels, and, most significantly, students [3]. In general, assessment for learning refers to all actions that teachers and students engage in to gather data that can be utilized to improve teaching and learning and report on student progress and achievement. To eliminate needless delays in rectifying students' errors, assessment for learning is centered on providing immediate and detailed feedback after each learning stage [1]. Assessment for learning should be a constant act that directs the teaching and learning process through timely feedback and not a one-time action [4]. The impact of feedback is commonly considered to be strengthened if and only if it is given immediately and explicitly in order to lead the learning process and correct any potential flaws [4]. In reality, giving learners immediate feedback helps them build a sense of responsibility and a self-monitoring mechanism, and also, the students get immediately involved in proper self-assessment and self-correction activities [1].

Literature on assessment has shown that incorporating formative assessment into classroom teaching and learning and giving timely feedback on students' performance in class tests, exercises, projects, and assignments can significantly improve students learning outcomes in science [1]. Although Ghana Education Service (GES) recommended formative school-based assessment to improve students' academic achievement, students' performance in integrated science remains problematic, especially those at the senior high school level [5]. This has been revealed in a plethora of research indicating that senior high school students performed poorly in integrated science [5], [6]. In the Gomoa East educational district in the central region of Ghana, Potsin T.I. Ahmadiyya senior high school students are not an exception to this poor achievement in integrated science. This is because the analysis of students' achievement in integrated science at the West Africa secondary school certificate examination from 2018-2020 highlights students' unsatisfactory achievement in integrated science. For instance, in 2018, 834 candidates sat for the WASSCE integrated science examination in the school, of which only 48.6% obtained A1-C6.

Similarly, 799 candidates participated in the 2020 WASSCE, and only 47.3% obtained A1-C6. Due to the importance of science in fostering discoveries of nature and as a requirement for admission to tertiary institutions in Ghana as well as the recent strong emphasis on Science, Technology, Engineering, and Mathematics Education (STEM) by the Ministry of Education, there is a pressing need for students to performed well in West Africa Secondary School Certification Examination (WASSCE) and obtained at most A1-C6 in integrated science to enable them secure admission to a tertiary institution. However, it is observed that many students tragically fail to obtain A1-C6 in their final examination in integrated science, disqualified from gaining admission into tertiary institutions for further studies [5]. Summative assessment, a one-time exercise, is thought to be one of the critical causes of such discouraging outcomes because it never diagnoses students' learning

issues accurately or immediately [1]. However, many experts believe that assessment for learning has the most significant impact on student's achievement in science [1]. According to Mahshanian, Shoghi, and Bahram [7], assessment for learning (formative assessment) related activities in the classroom communicate vital information about what is valued in the concept and impacts students' academic achievement. Also, experts in assessment recommended that teachers collect evidence on student learning using various assessment methods, and students should receive continuous and helpful assessment feedback rather than judgmental input about their academic achievement [1], [7]. It is against this recommendation that we intend to investigate students' perceptions of formative assessment, how their assessment data are being used to improve their learning, and the strategies employed by their teachers in teaching science. Investigating students' perceptions in this study was pertinent because it will bring to light students' views on assessment for learning [8], which can affect learning outcomes in integrated science and help plan effective teaching strategies. This is because the perceptions students have on assessment are relevant to their academic success [9], [10], [11] since students' learning outcomes are dependent on the perceptions they have of the teaching and assessment strategies employed in the classroom [12]. Ferreira and Santoso [13] and Yoon, Suh, and Park [14] state that students tend to perform better when they positively perceive their classroom activities, including teaching and assessment strategies. The exploration of teachers' teaching strategies in this study was pertinent because teaching strategies adopted by integrated science teachers play a significant role in students' achievement [13], [15]–[17], [18]. Though the integrated science syllabus for senior high school [19] recommended a student-centered approach, the need to investigate whether students take center stage in teaching and learning science is paramount

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2. METHOD

2.1 Research Design

As this study aimed to investigate the perception of senior high school students about assessment for learning and how they have been taught integrated science, a descriptive survey was adopted [20]. The reason behind the choice of the research design was to gain insights into how students have been taught science and their opinions or perception of assessment for learning on their learning outcome in integrated science [20].

2.2 Research questions

Three research questions were formulated to guide this study:

1. What are students' perceptions about assessment for learning?
2. What strategies are being used in teaching science to students?
3. How frequently are students being assessed in integrated science?

2.3 Participants or population

The population of this study consisted of 215 senior high school third-year students. These 215 participants were selected out of 1200 students using a stratified random sampling technique, as shown in Table 1.

Table 1. Participants based on the study program

Science	General arts	Business	technical	Visual art	Home economics
48	92	15	11	14	35

This sample was selected based on Van Dalen [21], who argues that a selected sample for a representation of a population should be at least 15% and above. The selected participants were then put into strata or given a quota based on their programs and randomly selected to participate in the study. Five participants from each stratum were randomly selected to inspect their learning portfolios. This sampling technique was selected because we wanted participants from the various programs of study to have a representation in the study since integrated science is a core subject and compulsory for all senior high school students.

2.4 Instrument for data collection

The instrument consisted of Assessment Experience Questionnaires to gather quantitative data and inspect students' classroom activity books or workbooks (number of exercises, assignments, projects, and the frequency of these activities). The questionnaires were adapted from Gibbs [22] to obtain the quantitative data, and some were modified to suit our intended purpose. The questionnaires were developed using a Likert scale such as strongly agree, agree, undecided, disagree, and strongly disagree and hardly ever (1), occasionally (2), sometimes (3), frequently (4), and almost always (5). The assessment experience questionnaires were administered to the participants. We also inspected the number of exercises, projects, assignments, and other activities from each of the 30 students selected from the strata to determine whether they had been given the required activities as recommended in the school-based assessment by the Ghana Education Service.

2.5 Pilot testing of the instrument

The questionnaires were administered to a Senior High School participant in the Gomoa West district to ascertain their reliability. Therefore, the school used for testing the questionnaires was not used in the main study. Fifty (50) final-year students took part in the pilot testing of the instrument. The participant took approximately 30 minutes to complete the questionnaires. The reliability coefficient for the questionnaires was 0.72. According to Ampiah [23], this value surpassed the reliability coefficient threshold value of 0.60, which is acceptable for research purposes. Cronbach's Alpha was used to analyze the reliability because the questionnaires were developed on the Likert scale.

2.6 Data collection procedure

Participants were put into strata based on their program of study (general science, home economics, business, general art, visual art, and technical). The questionnaires were then administered to the selected participants from each program in their classrooms. Five

students' workbooks or learning portfolios from each program who participated in answering the questionnaires were also inspected by us. The stratification of the participants was to provide an opportunity for students from each program who are taught and assessed by different integrated science teachers to provide their opinions about assessment for learning and their teacher's teaching strategies.

2.7 Data analysis

The data were analyzed using descriptive statistics such as frequency, percentage, and mean. This analysis was utilized because the data was collected using the Likert scale.

3. RESULTS AND DISCUSSION

The first research question sought to determine students' perceptions of assessment for learning. To measure their perceptions about this form of assessment, students were given assessment experience questionnaires designed to elicit their opinions or views on the subject under consideration. A descriptive statistic was used to analyze students' views about the assessment for learning with the results presented in Table 2.

Table 2. Students' perceptions about assessment for learning

No.	Student Response	SA (%)	A (%)	UN (%)	D (%)	SD (%)
1	I often found that having quizzes and assignments encouraged me to learn hard	50.7	26.5	8.8	7.4	6.5
2	Assessment for learning has helped me to improve my performance in science	40.9	36.3	12.1	7.0	3.7
3	Immediate feedback from teachers helps me to know my mistakes before it is too late	50.2	32.6	6.0	6.5	4.7
4	self-assessment has allowed me to understand my weaknesses and overcome them	47.4	38.6	5.6	4.7	3.7
5	the feedback I received prompted me to go back over a topic taught	45.1	39.1	6.0	5.6	4.2
6	peer assessment has helped me to practice teamwork and learn from my colleagues	45.6	34.4	7.9	7.0	5.1
7	Assessment for learning gives me enough time to think about my mistakes and learn	40.0	38.1	12.6	4.7	4.7
8	I paid attention to feedback on my work and tried to understand what I did right or wrong	42.8	36.7	9.3	4.7	4.2
9	assessment for learning helps us to become more responsible for our learning	42.8	36.7	9.3	7.0	4.2
10	assessment for helps to reduce the tension of final exams	42.8	35.8	9.8	7.9	3.7
11	assessment for learning helped me to track my progress and gave me information to see how far I have progressed in my studies	47.4	34.4	10.2	4.7	3.3
12	Assessment helps me to see areas in science where I need to improve	45.1	39.1	6.0	5.6	4.2
13	Teacher gives timely feedback on students' exercises, assignment, and tests	45.6	34.4	7.9	7.0	5.1

From the results in Table 2, the students seem to be impressed by the assessment for learning in the classroom. For example, the students positively perceive quizzes and assignments in the classroom as part of the assessment for learning activities. Students were also optimistic about immediate feedback as part of the assessment for learning activities. Self-evaluation and teamwork or peer evaluation were much appreciated in this research.

From the figures presented in Table 2, it was found that 77.2% agree or strongly agree that having quizzes, exercises, and assignments very often encourages them to learn hard and better their performance in integrated science. These activities offer them opportunities to work hard. Again, 82.8% of the participants believe that immediate feedback on their classroom assessment enables them to discover their mistakes and misconception and work towards correcting them before it is too late.

Similarly, most participants admitted that self-assessment as part of the assessment for learning has been vital to their learning in integrated science. In this regard, 86% of the students agree or even strongly agree that self-assessment has helped them identify their weaknesses in some areas of integrated science and work towards improving them. Furthermore, 80% of the students believed peer assessment has helped them practice teamwork, enabling them to learn from colleagues who might be good at other science topics. The majority of the subjects acknowledge that the feedback from their teachers is very vital to their learning outcomes. For instance, 84.2% of the students agree that the feedback from their teachers on their classroom assessment prompted them to go back over a topic taught in class and correct their mistakes. Regarding data for improving learning,78.1% of the participants acknowledge that classroom assessment, which is one form of assessment, provides them with enough time to think about their mistakes and prepare themselves adequately. At another point, the students were positive about classroom assessment in that 83.7% of them agreed that they paid attention to feedback on their work and used the feedback to assess what they did right or wrong.

Furthermore, most participants seem to be very optimistic about this type of assessment in that 79.5% of the students agree or even strongly agree that assessment for learning helped them become more responsible for their learning outcome in integrated science. One of the key findings was that most participants (78.6%) agree that assessment for learning helps reduce the tension and anxiety during the final examination at the end of their course of study. Moreover,81.4% of the students agree that assessment helps them track their progress and provides information on their progress in their studies. Similarly, 86.6% of the participants agree that assessment for learning activities helps to identify areas/ concepts in science that they need to improve upon. The participants seem not to be impressed by the frequency of feedback on their work from their teachers in that 69.3% of the students disagree or strongly disagree that teachers provide timely feedback. For maximum learning outcomes to be attained, students should be given feedback on the learning so that they can adjust their learning strategies.

Findings from Table 2 revealed that students positively perceive assessment for learning. They believe that assessment for learning can potentially reduce tension during the WASSCE and improve their learning outcome. This finding is similar to the argument

made by Beatty and Albert [8] that students' perception impacts their learning outcomes in science. Similarly, this finding agrees with Johnson [10] and Uiboleht, Karm, and Postareff [12], who found that students' perceptions about assessment are relevant to their academic success because they tend to perform better when they have positive perceptions about their classroom assessment. Assessment for learning begins with teacher preparation, communicating learning objectives with students, marking, rating, and feedback. These tactics guarantee that learning outcomes are explicit and that students are given correct information about the next steps in the short-term planning process. This ensures that students and teachers focus on the main objectives of the teaching and learning process. As a result, assessing learning strategies such as assessment for learning allows the teacher to track and identify students' progress, give targets, and keep records of student learning needs. In other words, teachers are guaranteed to know precisely where their pupils are in their learning to plan where they need to go next [1]. Students will only be able to reach their learning goal if they understand the goals or objectives of the lesson and can determine what they need to do to achieve the learning goal. Unfortunately, as revealed in our study, 47.5% of participants believed that teachers hardly or occasionally stated the lesson's objectives or goals before the commencement of the teaching and learning process. This could contribute to students' unsatisfactory performance in integrated science, as observed in the district. This finding is in consonant with Umar [1] that specific learning objectives or goals and learning-oriented assessments promote or encourage performance-enhancing approaches by giving students strategies to close the gap between their current performance and desired learning outcomes. When exploring this type of evaluation/assessment in an ideal classroom, one area frequently causes argument among researchers or scholars in education is the issues of feedback, grading, and marks.

Also, as revealed in Table 2, feedback is a critical component of assessment and effective teaching and learning. Regarding feedback, our finding is inconsistent with Ampiah [23], who found that feedback with grades or marks alone does not impact students' learning outcomes. In reality, there is more evidence that students benefit the most from assessments in which the feedback is delivered without marks or with marks [1]. As elaborated by Umar [1], Where grades are offered, they frequently seem to captivate the students' imaginations and are viewed as the ultimate objective of exploration. Our finding also revealed that students positively perceive feedback and asserted that feedback from their teachers is vital to their learning outcomes. For instance, 84.2% of the students agree that the feedback from their teachers on their classroom assessment prompted them to go back over a topic taught in class and correct their mistakes. This finding is similar to Herman [24] in that feedback becomes practical and essential to teaching and improving students' future learning only when given timely. Despite students showing positive opinions about feedback, they were not impressed by the frequency of feedback on their work from their teachers in that 69.3% of the students disagree or even strongly disagree that teachers provide timely feedback on their work. This assertion was confirmed by examining their learning portfolios, which revealed many unmarked exercises, class tests, and assignments.

The second research question sought to determine the procedure employed by science teachers in teaching science to students. To do this, students' responses to the procedures used in teaching them were analyzed using descriptive analysis and results, as shown in Table 3.

Table 3. Teaching strategies

No	Student Response	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
1	Teacher displayed personal interest in students learning and achievement in science	24.7	18.6	27.9	15.8	13.0
2	the teacher made it clear the objectives of the concept and what is expected of the students on the topic before the instruction	23.3	24.2	20.0	19.1	13.4
3	The teacher scheduled class activities to encourage students to stay active during the lesson.	27.0	23.3	23.3	12.1	14.3
4	teacher formed teams or discussion groups to facilitate teaching and learning science	30.7	20.9	14.0	11.6	19.5
5	teacher takes time to explain each concept clearly to the understanding of students	23.7	20.0	16.3	20.0	20.0
6	the teacher involved students in hands-on activities in science	34.0	20.9	14.0	11.6	19.5
7	Teachers create opportunities for students to ask questions and contribute to class discussion.	25.1	20.5	10.2	20.0	24.2

Teaching and learning include but are not limited to board and chalk; expressing interest in our students and encouraging and having good interpersonal relationships are critical for successful learning outcomes. However, the results in Table 3 show that 24.7% of the participants are of the view that their teachers hardly ever show personal interest in their learning outcome in science,18.6% of the students admit that their science teachers occasionally show personal interest in their learning outcomes,27.9% of the subjects also admit that teachers sometimes show interest in their learning outcome whereas 15.8% and 13.0% of them admitted that teachers frequently and almost always show interest in their learning respectively. Similarly, 23.3% admitted that teachers hardly stated the objectives of the concept to be taught and what is expected of them before teaching the topic,24.2% of the subjects were of the view that teachers occasionally stated the objectives of the lesson,20% of the students thinks teachers sometimes stated the lesson objectives. Key to this finding is that only 13.4% of the participants admit that teachers almost always state the lesson's objectives.

Furthermore,27.0% of the students admit that teachers hardly scheduled their learning activities in a way that would encourage them to participate actively, and 23.3% of the participants admit that teachers occasionally make teaching and learning interactive. In comparison, 12.1% and 14.3% agree that teachers frequently and almost always make teaching and learning interactive. At another level, the participants believed that teaching and learning in the classroom is more teacher-centered than student-centered. For

instance,30.7% of the subjects admitted that hardly do teachers provide opportunities for them to form discussion groups during teaching and learning, while 20.9%, 11.6%, and 19.5% of the students agree that teachers occasionally, frequently, and almost always allow them to work as a team during teaching and learning in the classroom respectively. Moreover, only 40.0% of the students agree that teachers frequently or almost always take time to explain science concepts clearly to their level of understanding, whereas 60.0% admit that teachers hardly or occasionally or even sometimes take his / her to explain science concepts clearly to them. Again, 25.1% of the students admit that teachers hardly create room for them to ask questions or contribute to the teaching and learning of science, while 20.5% of the participants acknowledge that teachers occasionally involve them in teaching and learning. However,20.0% and 24.2% of the students acknowledge that teachers frequently and almost always involved them in classroom discussions. As stipulated in the integrated science syllabus [16], which emphasizes a constructivist approach to teaching and learning, students are believed to engage in "hands-on activity-based learning" to foster learning outcomes in science. However,54.9% of the participants admit that teachers hardly or occasionally involved them in activity-based learning, whereas 14.0%, 11.6%, and 19.5% of the students acknowledge that teachers sometimes or frequently involved them in practical learning in science, respectively.

Table 3 shows that teachers practice teacher-centered instructional strategies instead of student-centered teaching approaches as recommended by Ghana Education Service and integrated science syllabus for senior high school [19]. The majority of the students were not satisfied with their engagement in the teaching and learning process by their teachers. For instance, 50.3% of the participants admitted that science teachers hardly or occasionally scheduled their teaching and learning activities in a way that encouraged them to participate actively. In comparison, 51.6% also admitted that teachers rarely provide opportunities for them to form discussion groups during teaching and learning. Teaching is always teacher-centered, against the standard teaching approach prescribed by the Ghana Education Service and the Ministry of Education, which advocate for a constructivist teaching approach. This practice could be a factor that accounts for the low achievement of students in integrated science in the district. This finding is similar to the finding of Bua & Akuffo [15], who found the teacher-centered approach to be the cause of the poor performance of students in science-related subjects.

The third research question sought to determine how frequently students have been assessed in integrated science. To answer this research question, students learning portfolios were inspected by us, as shown in Table 4.

Table 4: Student assessment data (learning portfolios)

Program of study	Assessment per academic year	Marked (feedback)	Unmarked (no feedback)
General Science	8	6	2
General arts	9	4	5
Home economics	10	3	7
Visual art	13	8	5
Business	12	7	5
Technical	9	4	5

Table 4 revealed that students were not given enough or the required number of formative assessments. Even though formative assessment can be verbal during the teaching and learning in the classroom but the essence of this form of assessment is to gather data that could be used by the teacher to plan instructional strategies effectively and to correct students' misconceptions and flaws and also assist students to engage in self-correction and assessment [1]. However, our inspection of students' assessment books revealed that students were not given enough assessments as recommended in the integrated science syllabus and school-based assessment procedure. Our inspection further revealed that most science teachers assessed students on some topics taught by giving them exercises and class tests but failed to provide feedback on those activities (unmarked exercises).

Finally, it was found that 77.2% of the participants agree or strongly agree that having quizzes, exercises, and assignments very often encourages them to learn hard and better their performance in integrated science. Unfortunately, our inspection of their learning activities books revealed that they were not assessed frequently, and the few assessment data do not meet the standard prescribed in the integrated science syllabus [19]. The syllabus advocates that students should be assessed at the end of each topic/concept taught to identify what needs to be done before moving to the next lesson. As elaborated by Taale [25], testing and providing feedback frequently enables learners to identify their weaknesses and strengths by offering them more time to correct their mistakes and misconceptions before taking their final WASSCE exams. From the literature, it could also be argued that frequent assessment and feedback reinforce learners, reducing anxiety during their final examination and enabling teachers to monitor learners' progress [1].

4. CONCLUSION

Based on the result of this study, it can be concluded that students have a positive perception of assessment for learning. It can also be concluded that integrated science teaching in the district is predominantly teacher-centered instead of student-centered. It is, therefore, not farfetched to conclude that the poor performance of students in integrated science could be attributed to teachers' teaching strategies. Even though assessment for learning, including feedback on students' learning, has proven effective in improving students' academic success. However, it was revealed from the findings that students are not frequently assessed, and feedback from their teachers on their work was also inadequate. This situation does not augur well for students' achievement because it does not allow students to engage in self-assessment and correct their mistakes and misconception before the WASSCE examination.

Based on the analysis of the participant's responses concerning the three research questions that guided this research, it is not farfetched to conclude that the outcomes of this study add to the argument in the literature that assessment for learning has a significant impact on teaching and learning of senior high school integrated science. The current study's findings add to the literature on the impact of positive perceptions on students' academic achievement in integrated science. The outcome of this current study also contributes to the literature on the argument that the teacher-centered teaching approach

contributes to the poor academic performance of senior high school students in integrated science in Ghana.

5. RECOMMENDATIONS

Based on the findings, it is recommended that there should be proper supervision to ensure that students are well assessed in the concepts they have been taught and that the assessment should be a continuous practice, not a one-time practice. Though the senior high school integrated science syllabus prescribed a constructivist (student-centered) approach, it falls short of indicating which constructivist approach should be used in teaching integrated science, making it difficult for teachers to employ a student-centered approach. As a result, it is recommended that a specific constructivist (student-centered) approach should be prescribed in the integrated science curriculum for teachers to willfully used in teaching to improve students' academic success in integrated science.

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