

School Based Assessment Framework: Senior High School Mathematics Teachers' Use of Assessment Modes

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Abstract: Under the School Based Assessment (SBA) framework, Ghanaian mathematics teachers are required to undertake classroom assessment practices that promote quality learning and ultimately provide cumulative assessment data for standardization and integration into candidates' external national examinations results. Over the years however, there have been concerns that the teachers' frequent use of traditional modes of assessment tend to limit students' mathematical thinking and produce inaccurate data for SBA. This study sought to examine the kind of modes used by mathematics teachers and how often they use these assessment modes at the senior high schools. Descriptive survey design was used involving a purposive sampling technique of 97 senior high school mathematics teachers who responded to the questionnaires. Data on assessment modes were analyzed into percentages and frequencies while the test for associations were established using Chi-square at .05 significance levels. The results showed that more than 85% of the mathematics teachers often or always used class exercise, class test, homework and group work for assessment data for SBA records. More than three-quarters of the mathematics teachers neither used project works nor portfolios to obtain data for classroom decisions and SBA records. There were no significant associations between gender, teaching experience and qualification regarding how often mathematics teachers used assessment modes. The study concludes that the modes frequently used by senior high school mathematics teachers in the study may neither elicit higher order mathematical thinking nor meet the prescribed standards under SBA framework. The study recommends that senior high school mathematics teachers should comply with the assessment modes ascribed in the SBA to instill high order mathematics thinking skills in the learner and provide accurate assessment data. The study also recommends Ghana Education Service to regularly organized workshops for mathematics teachers on the implementation of SBA.

Keywords: Mathematics Teachers, School Based Assessment, Senior High School

1. Introduction

Classroom assessment is often conducted by the mathematics teacher to gather data about students' performance on learning tasks to determine how far students are achieving instructional objectives [35, 4]. By gathering, interpreting and synthesizing classroom assessment data, the mathematics teacher can understand his/her students' learning progression, plan suitable lessons and nurture a conducive classroom atmosphere for effective learning. Over students' life in school, mathematics teachers are often supposed to provide comprehensive data on individual

student that can be used to make decisions toward improve learning successes. Research has shown that the aim of classroom assessment cannot be achieved if the mathematics teachers who are the implementers, do not follow procedures which the curriculum provides to realize this aim. It is however anticipated that if these procedures are duly followed by the mathematics teacher, there should be reflection in the performance of students even in external examinations [6, 4, 35].

The School Based Assessment (SBA) is a comprehensive assessment framework adopted to ensure that mathematics teachers provide classroom assessment data that should then be standardized and incorporated into the students' final scores

which subsequently are used in the external national examinations organized by the West African Examinations Council [35].

The national pre-tertiary learning and assessment framework [25] has brought about public acceptance of classroom assessment practices as an essential feature in promoting the quality of teaching and learning in the senior high schools. Also, many researchers have also placed much attention on classroom assessment practice as a significant factor in mathematics teachers' training and professional development [22, 4, 37, 21]. Most studies have concentrated on perception of which they reported that, Ghanaian teachers mostly use test and other forms of traditional methods in assessing pupils and the assessment items require the application of low order thinking skills [17, 24, 27, 8]. It is within this literature gap that this study sought to examine how often mathematics teachers use classroom assessment modes prescribed under the SBA and the associations to demographics characteristics such as gender, teaching experience and professional qualification in Senior High Schools. There are however little or no empirical studies on how often mathematics teachers especially in the Ghanaian Senior High Schools use classroom assessment modes.

1.1. Research Question

How often does mathematics teachers in Senior High Schools in the Northern Region of Ghana use classroom assessment modes ascribed in the SBA?

1.2. Hypothesis

There is no significant association between Senior High Schools mathematics teachers' demographic characteristics (professional qualification, teaching experience, gender) and how often they use classroom assessment modes.

1.3. Significance of the Study

Classroom assessment in mathematics is very essential because, teachers' classroom assessment practices can have a very serious effect on the outcome of students' achievement in the classroom [4, 16]. As a result, exploring research in the area of mathematics teachers' classroom assessment practice is unquestionable. Findings of this research would be helpful to stakeholders of education to support teacher's professional development which will lead to proper use of classroom assessment modes within the SBA framework. The findings would also provide vital information to other researchers who are interested about the use of classroom assessment modes by teachers of different demographics.

2. Literature Review

Assessment plays a very important role in education because it provides information to the teacher as to what to do in order to improve and develop students' abilities [28, 14]. However, the Ministry of Education report indicated that, the assessment system has a lot of challenges and its content and its implementation are academic and examination focused [9].

This claim is supported by the World Bank's [36] on Systems Approach for Better Education Results which revealed that, classroom assessment practices in Ghana are generally weak and that there is no enough systems put in place to monitor their quality. These literature points to the fact that assessment is a key ingredient in promoting quality education and should not be overlooked.

Teachers are responsible for continual assessment of the amount of learning done within stipulated periods of instruction [1]. In Ghana, the SBA framework is the guide for gathering periodic information on students learning status, achievement and planning improvement in educational delivery. In the SBA, the teacher is required to conduct four assessments referred to as Class Assessment Tasks (CAT) for the purpose of documentation. These tasks are intended to inculcate high-order thinking, problem-solving, cooperate learning and self-assessment in students [25]. CAT1, is a task made up of class test items to be scored out of 10 and to be conducted at the end of the first month of the first term. CAT2, is a group work that will also be marked out of 10 to be conducted at the end of the second month of the term. CAT3, is also a class test that should be administered at the end of the third month and scored out of 10. The last assessment is the project which is CAT4, the teacher is expected to give the project to the students at the beginning of the term and the results submitted at the end of the term and this will be scored out of 20. This means that the teacher would score the SBA out of 50, leaving the remaining 50 to be scored in the end of term examination. These activities are expected to be replicated every term throughout the year [25].

The SBA requires mathematics teachers to be more creative in their approach to the use of classroom assessment modes. However, this appears not the case as teachers in the senior high schools still use the traditional assessment modes such as class tests and exercises that provide inaccurate data about the learner [15]. Ahenkora [2] argued that there is a seemingly lack of knowledge of the implementation of the SBA which is worrying and needs to be addressed.

A study conducted by Michael et al [24] on Ghanaian teachers' assessment practices and challenges of integrating problem-solving and investigations in teaching mathematics reported that, even though the professional teachers use multiple assessment techniques in their problem-solving and investigation lessons, about 63% rely on traditional modes rather than alternative assessment techniques. Amedahe [5] also found that Ghanaian teachers lacked the skills and do not follow the guidelines stipulated in the SBA. In a similar vein, Awoniyi et al [10] explored Senior High School mathematics teachers' use of SBA guidelines in the Cape Coast Metropolis in Ghana and the results revealed that mathematics teachers do not follow the SBA principles on testing and construction of teacher-made or classroom tests.

All the above findings and that of [34, 6], confirmed that majority of teachers still practice the old continuous assessment in which students' assessment scores were

used purposely for promotion, selection, awarding of prizes, ranking, record keeping, providing feedback to parents, and preparing students for examination. Despite the fact that teachers in their training programs are taken through a full course in measurement and evaluation and are expected to have the propensity to employ the various assessment modes correctly, the implementation of SBA appear problematic. In particular, studies by [7] and [26] corroborated the problem of mathematics teachers' adherence to laid down rules in the practice of the SBA.

McMillan [23] asserted that teachers' decision-making in the classroom is mostly influenced by classroom realities such as absenteeism, disruptive behavior, heterogeneity and a variety of external factors including accountability and parents' expectations. This assertion is supported by [18, 31] and [30], who posited that classroom assessment strategies are influenced by types of classroom size, teachers' qualifications, teaching experience and heterogeneity. This means that even though teachers have the responsibility in the classroom to decide the mode of assessment, they always assess their students' learning based on several influential factors. Till date, there is little or no empirical studies on how the teacher gender, teaching experience and professional qualification could affect how often they use classroom assessment modes.

3. Methods

3.1. Participants

The participants for the study were a purposive sample of 97 mathematics teachers from eleven (11) "category C," Senior High Schools in the Northern Region. In Ghana, due to the Computerized School Selection and Placement System (CSSPS) introduced in 2005, all the senior high schools were group into category based on performance and infrastructure. The participants had attained a minimum of first degree and are recognized as fully qualified mathematics teachers by the Ghana Education Service (GES). The sample comprised seven (7) female teachers and ninety (90) male mathematics teachers. Out of the 97 participants, 74 representing 76.3% had Bachelor's degree (B. ED, BA/BSC) and 23 representing 23.7% had Master's degree (PGDE, MED, MA/MSc). The age of the participants ranged from 28 to 55 years. Participants' years of experience in teaching mathematics at the senior high school ranged from 1 to 30 years.

3.2. Data Collection and Analysis

The researcher constructed a five-point semantic differentiated scale questionnaire with an expert advice to ensure validity and reliability. A reliability coefficient of 0.76 was realized from the pilot study. The questionnaires were subsequently administered to selected participants in the Senior High Schools and the researcher gave the participants' time to think through and respond and return the answered questionnaire in a week time.

The responses of the participants to each questionnaire were

analyzed using the IBMSPSS version 20. The questionnaire which was on five-point semantic differentiated scale was coded and keyed into IBMSPSS version 20. The items were coded as follows: "never" (1), "not often" (2), "often" (3), "very often" (4), and "always" (5). Both descriptive and inferential statistics were used to present the results of the study. The Pearson Chi-square test was employed to test the hypotheses on significant association between qualification, teaching experience and gender of mathematics teachers in senior high schools regarding how often they use various assessment modes.

4. Results

4.1. Results for Research Question

The study sought to find how often mathematics teachers use various classroom assessment modes ascribed in the School Based Assessment (SBA). Table 1 shows the frequencies and percentages of how often mathematics use the assessment modes outlined in the SBA framework.

Table 1. Frequency (percentage) of how often teachers use classroom assessment modes.

Assessment Mode	Not Often (%)	Often (%)	Always (%)
Project	82 (84.5)	15 (15.5)	0 (0)
Portfolio	84 (86.6)	13 (13.4)	0 (0)
Homework	10 (10.3)	75 (77.3)	12 (12.4)
Group Work	13 (13.4)	77 (79.3)	7 (7.3)
Class Test	7 (7.3)	70 (72.3)	20 (20.6)
Class Exercise	5 (5.2)	53 (54.6)	39 (40.2)

Cumulatively, 82 constituting 84.5% of the teachers indicated that they do not often use projects in their mathematics classroom. Only 15 (15.5%) of the participants said they often use projects to assess students. This implies that majority of the teachers in senior high schools do not follow the guidelines in the SBA regarding the use of projects.

Table 1 also shows that 13 (13.4%) of the teachers responded that they often use portfolio as an assessment mode though, the majority of the participants (86.6%) indicated that they do not often use portfolio in assessing their students learning. This is contrary to the recommendation by the SBA as cited in the national pre-tertiary learning and assessment framework report, 2020.

It was further revealed that, 10 (10.3%) of the total participants indicated that they do not often use homework in their mathematics lessons and 75 (77.3%) indicated that they often use homework to assess their students learning. Also, 12 (12.4%) of the teachers indicated that they always use homework to assessment their students. Cumulatively, 89.5% said that they use homework as an assessment mode as stipulated in the new curriculum.

From Table 1, it was clear that 7 (7.3%) of the teachers said that they always use group work to assess students learning, but it was further revealed that, 77 (79.3%) of the teachers said they often use group work for assessing their students. On the contrary, 13 (13.4%) of the

participants indicated that they do not often use group work in assessing their students. Cumulatively, 86.6% of the respondents indicated that they use group work as an assessment mode in their mathematics class to assess students learning.

Results from Table 1 also show that, 20 (20.6%) of the participants said they always use class test while 7 (7.2%) of the participants do not often use class test. Table 1 again show that 70 (72.2%) of the participants often use class. Cumulatively, 92.2% of the participants indicated that they use class test to assess their.

The use of the class exercise is similar to class test. Particularly, 39 (40.2%) of the participants use class exercise always, 53 (54.6%) often use class exercise and 5 (5.1%) do not use class exercise. Cumulatively, 94.8% of the participants reportedly use class exercise in their mathematics classes.

In a nutshell, the use assessment mode teachers in senior high schools in order of most frequent were class exercise, class test, group work and homework.

4.2. Results for the Hypothesis

The second part of the study was to test the hypothesis that there are no significant associations between senior high schools mathematics teachers' demographic characteristics (professional qualification, teaching experience, gender) and how often they use classroom assessment modes.

Table 2 displays the results of a Pearson chi - square test of significant association between teachers' frequent use of assessment modes and their professional qualification such as B. ED, BA\BSC, PGDE, MED, MA\ MSC.

Table 2. Chi-Square results on how often teachers use classroom assessment modes and their professional qualification.

Assessment Mode	Chi Square (X^2)	Df	p
Project	6.972	12	.859
Portfolio	8.856	12	.715
Homework	21.392	16	.164
Group Work	12.929	16	.678
Class Test	17.347	12	.137
Class Exercise	19.552	16	.241

0.05 significance level.

Results from Table 2 revealed X^2 (Df=12, 97) = 6.97, $p < .859$ which means that there is an significant association between project and the teacher's professional qualification, similarly, it is clear from Table 2 that the p-values for all the classroom assessments modes were greater than a significant level of .05. This implies that, there exist statistically significant associations between teachers' professional qualification and their use of classroom assessment modes. This means the teachers do not differ in how often they use the classroom assessment modes.

Table 3 also shows a Pearson Chi-square carried out to determine the association between teachers' assessment mode and their teaching experience.

Table 3. Chi-Square results on how often teachers use classroom assessment modes and their teaching Experience.

Assessment Mode	Chi Square (X^2)	Df	p
Project	9.519	9	.391
Portfolio	10.659	9	.300
Homework	15.054	12	.239
Group Work	6.475	12	.890
Class Test	9.134	9	.425
Class Exercise	10.573	12	.566

0.05 significance level.

Results from Table 3 revealed the p-values for all the classroom assessments modes were greater than a significant level of 0.05. The results imply that, there was significant association between teachers' classroom assessment modes and their teaching experience. Hence, it can be concluded that teachers do not differ in how often they use classroom assessment modes by their teaching experience.

Finally, Table 4 depicts Pearson - chi square test to determine whether there is a significant association between mathematics teachers' gender and their use of classroom assessment modes.

Table 4. Chi - Square results on how often teachers use classroom assessment modes and gender.

Assessment Mode	Chi Square (X^2)	Df	p
Project	.551	3	.908
Portfolio	1.361	3	.715
Homework	3.896	4	.420
Group Work	2.27	4	.685
Class Test	2.919	3	.404
Class Exercise	1.131	4	.889

0.05 significance level

The result in Table 4 is similar to those of Table 2 and Table 3. Since the p-values of all the assessment modes in Table 4 are all greater than the alpha level of .05, it can be concluded that there are association between the gender of teachers and how often they use classroom assessment. Hence, the male and female teachers do not differ by how often they use a particular classroom assessment mode.

5. Discussion

Under the School Based Assessment (SBA) framework, Ghanaian mathematics teachers are required to undertake classroom assessment practices that promote quality learning and ultimately provide cumulative assessment data for standardization and integration into candidates' external national examinations results. Over the years however, the question of whether mathematics teachers are fully implementing the SBA framework remains unanswered. This present study examined how often mathematics teachers use various assessment modes, within the SBA framework, at the senior high schools in Ghana. The main assessment modes identified in the mathematics classroom in the senior high schools included class exercise, class test, group work, homework, project and portfolio. On these modes, it was found that majority of the mathematics teachers are

frequently using assessment modes were class exercise, class test, group work and homework. The finding suggests that the mathematics teachers in this study may not be complying with the SBA guidelines of obtaining accurate and comprehensive assessment data on students for purposes of promoting quality learning and providing cumulative data for the grading system at the senior high schools. This finding is supported the claim elsewhere that most mathematics teachers rely on the use of test, homework and classroom exercise which do not holistically gauge students' understanding levels [33, 13, 19, 3]. Berenson and Carter [11] also reported that frequent use of class exercise, class test, group work and homework tends to make students' focus on arriving at answers or grades rather than developing mathematical reasoning skills. The reasons for such practices might vary. However, [30] and [23] claimed that teachers' belief system, assessment literacies as well as classroom realities may be limiting factors for teachers' decision to use variety of assessment modes. These factors therefore need to be tackled through teacher training and professional development programs to ensure the mathematics teachers' full compliance with SBA framework in their assessment practices.

Another significance objective of this study was to find out if there are significant associations between the mathematics teachers' professional qualification, teaching experience, gender, and how often they use classroom assessment modes. The study found that the mathematics teachers' frequency of use of various assessment modes do not differ by gender, teaching experience and professional qualifications of mathematics teachers. It was also clear that how often mathematics teachers use the assessment modes identified in this study did not differ by professional qualification such as BED, MED, MA, MSC and MPHIL. This finding is similar to finding by [32] where teachers' professional qualification had strong association with their classroom assessment practices. It was also found that the teaching experience of the mathematics male or female teachers has association with how often they use various classroom assessment modes. This again corroborates an earlier study [32, 12] which reported that the more a teacher's teaching experience, the better he or she is able to use appropriately assessment strategies in the classroom.

As indicated earlier there are many external factors prompting mathematics teachers' decision to frequently use specific assessment modes [30, 23]. Research suggests for example that the mathematics teachers' frequent reliance on an assessment mode could depend on the class size [20, 29]. In Ghana, the standard class sizes for senior high schools to ensure effective teaching and learning is between 35 and 40 students. However, in most senior high schools, most mathematics teachers handle huge class sizes of up to 80 students. Therefore, it could be expected that these large class sizes may be a factor in the mathematics teachers' decisions to implement fully all four Class Assessment Tasks (CAT) under the SBA framework. To ensure quality learning and assessment data, mathematics teachers it is incumbent on

the mathematics teachers to endeavour to adopt a more contemporary approach to classroom assessment. The changing perspective is supported by the need to use classroom assessment strategies such as SBA to promote a quality data for decision making towards effective learning.

6. Conclusion

The study concludes that majority of the mathematics teachers in the study frequently use assessment modes that are not comprehensive of the SBA framework and may not elicit high order mathematical thinking. Data obtained in such assessment modes may not also be representative of the mathematical abilities of students. Finally, the fact that in this present study, the mathematics teachers' qualification, gender and teaching experience relate to the frequency with which they use a given assessment mode means that, the teachers' assessment practices are homogenous across the assessment modes identified in this study.

7. Recommendation

The study recommends that head of mathematics department in various senior high schools should periodically carry out needs assessment to enable mathematics teachers practice SBA underlined in the curriculum. It is also recommended that the Ghana Education Service should organized workshops for mathematics teachers on the implementation of SBA. Ghana Education Service should also develop an assessment resource bank containing projects and portfolio building tasks for use by mathematics teachers to ensure appropriate classroom assessment practices. The study also recommends that senior high school mathematics teachers should be motivated comply with the assessment modes ascribed in the SBA to instill high order mathematics thinking skills in their students.

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