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EXAMINE SENIOR HIGH SCHOOL MATHEMATICS TEACHERS' ASSESSMENT FOR LEARNING PRACTICES FOR STUDENTS' PROGRESS AND BETTER EXAMINATION ATTAINMENT

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Abstract:
The study examined the perception of senior high school mathematics teachers and students regarding teachers' use of Assessment for Learning (AfL) practices to enhance students' progress and examination performance. Assessment for Learning (AfL) is recognized in the literature as having a strong impact on students' learning outcomes when actively infused in the teaching process. However, limited studies have explored both students' and teachers' perspectives on the use of AfL strategies for improving students' performance. The study applied questionnaires for 728 participants (308 senior high school mathematics teachers and 420 senior high school students) in the Ashanti region of Ghana. The study findings revealed that questions, quizzes, and homework are perceived by both groups as the most effective teachers' AfL practices in supporting students learning and improving examination attainment. The study, therefore, provides

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information for professional development for teachers and re-orients teachers on the effective use of AfL practices in the classroom.

Keywords: assessment for learning practices, students' progress, senior high school teachers and senior high school students

1. Introduction

Classroom assessment is one component of teaching activities, which serves both formative and summative functions (Black *et al.*, 2004; Schellekens *et al.*, 2021) for decisions made about students' learning in the classroom (McMillan, 2008). Globally, assessment plays a key role in the teachers' delivery of quality education at all levels (Brown, 2022). Research has revealed that student-involved classroom assessment practices–formative and summative purposes lead to substantial improvement in learning outcomes (Stiggins & Chappius, 2002; Black & Wiliam, 2018; Taras, 2005). The summative function of assessment is when it is used for purposes of accountability, ranking, certification, and judgment of students' achievement. On the other hand, the formative purpose of assessment is to support students' learning (Black *et al.*, 2004; Schellekens *et al.*, 2021).

On a global scale, teachers encounter challenges in supporting students' continuous learning in the classroom. For instance, Sahito *et al.* (2024) explored the perceptions of three elementary Mathematics teachers regarding AfL from Pakistan using semi-structured interviews and observations. The study showed that teachers do not understand AfL sufficiently, resulting in poor classroom implementation. To address this, the authors proposed an assessment literacy program to enhance teachers' knowledge of different assessment methods.

In this technological era, Mathematics is a crucial discipline in global education, serving as the foundation for science, technology, business, and the humanities (Fitzmaurice *et al.*, 2021). This is why developed countries such as the United States, Singapore, Canada, United Kingdom, China, Japan, Finland, etc., have advanced in Science, Technology, Engineering and Mathematics (STEM) due to their strong foundation laid on Mathematics education (Thibaut *et al.*, 2018; Tilky *et al.*, 2018). There is a positive relationship between countries with high performance in the Trends in International Mathematics and Science Study (TIMSS) and the economic development of the country where the performing countries from the TIMSS examination are the best economies in the world (Oppong-Gyebi *et al.*, 2023). This makes Mathematics education the backbone for the national development of every country. However, Ghana performed low in the TIMSS examination conducted in 2003, 2007 and 2011 (Anamuah-Mensah *et al.*, 2009). For instance, in the 2003 TIMSS examination, Ghana was ranked last but one (45^{th}) out of 46 countries that took part in the examination. Even though the performances improved in 2007 and 2011, Ghana remains among the lowest in Africa and the world since they were placed in the ranking (Mullis *et al.*, 2012; Adu Obeng *et al.*, 2021). Poor

performance in Mathematics in the West Africa Secondary School Certificate Examination (WASSCE) has also resulted in low qualification rates for most students to further their education at the tertiary level (Fletcher, 2016). Despite improvements in students' Mathematics performance in the WASSCE over the years, it still falls below the expected standard set by the Ministry of Education in 2018. One factor for this low performance is teachers' assessment practices. For example, Enu (2021) posited that teacher educators' assessment practices are among the factors influencing students' performance in mathematics. Therefore, Mathematics should be taught using different strategies to engage students. This is why Abdulwahed *et al.* (2012) suggested that teachers should use collaborative, inquiry-based, problem-solving, and discovery-based learning strategies to enhance students' deeper understanding of Mathematics.

Concerning education, Ghana has a three-tier education structure of 11 years of basic education (2 years of pre-school, 6 years of primary and 3 years of junior secondary school), followed by 3 years of senior secondary and 2-4 years of tertiary education (Ministry of Education, 2018). There is no formal assessment at the end of the first 6 years of primary education, and this builds up for certificates to be issued based on school-based assessment at the end of the 9 years of education. The Basic School Education Certificate is issued after the final examination administered by the West African Examinations Council for Junior High School students, which determines students' entry into Senior High School education in Ghana (Ministry of Education, 2018; National Council for Curriculum and Assessment, 2019).

In Ghana, education is governed by the Ministry of Education, where the National Council for Curriculum and Assessment (NaCCA) is one of the agencies mandated by the Educational Act of 2008 (Act 778) to oversee the development of national curriculum and assessment standards for pre-tertiary educational institutions. A review of the pre-tertiary curriculum in 2018 identified assessing pupils' progress in learning as a problem area that needs attention, and it was recommended that all teachers in various training institutions should be trained in assessment. A key difference lies in teachers' assessment practices: summative assessment (AoL) versus formative assessment (AfL), focusing on assessment of learning and assessment for learning, respectively (NaCCA, 2019). The new educational reform policy for the Ghanaian educational system calls for a review of teachers' assessment practices, emphasizing the implementation of AfL to support students' learning outcomes, particularly in Mathematics, which has often been identified as difficult for Ghanaian students to learn and for teachers to teach (Davis *et al.*, 2020).

However, there is a lack of baseline data on how teachers use assessment to support student learning and the achievement of learning outcomes, even though various studies in Ghana have researched assessment at all levels of education. Asare (2015) examined the classroom assessment practices of 192 kindergarten teachers using a mixed-method approach of questionnaires and interviews for the teachers. The study revealed that teachers used assessment practices of paper and pencil tests most often. It was also revealed that teachers used their practices to satisfy educational leaders and parents.

Again, Osman (2021) examined the classroom assessment practices of teachers and demographic characteristics that influence their assessment practices using a mixed method approach of questionnaire and interview for 260 basic teachers. It revealed basic teachers used class exercises, oral questions, homework and class tests as the most used practices of the teachers. Similarly, Asare (2020) examined basic teachers' perceptions and practices of formative assessment practices; Buabeng *et al.* (2019) studied the perceived influence of assessment on the teaching and learning of Mathematics at junior high schools in Ghana and Eshun *et al.* (2024) investigation of the factors that influence formative assessment practices of junior high school social studies teachers. Previous studies have not explored how teachers' AfL practices impact students' learning and examination performance, creating a gap in the research.

Further, at the secondary school level, various research studies are being carried out in the area of assessment. For example, Davis and Gbormitteh (2023) ascertained senior high school Mathematics teachers' perceived continuous assessment and the difficulty Mathematics teachers faced using continuous assessment. The study revealed that Mathematics teachers used continuous assessment to generate grades at the end of the term to inform parents about their children's achievement. Moreover, Akayuuri (2021) exploration of Mathematics teachers' implementation of classroom assessment within the school-based assessment revealed that the literacy level of Mathematics teachers in Ghanaian senior high schools is limited in assessment practices to stimulate students' mathematical thinking skills. Thus, there is a need for teachers' knowledge of the use of assessment practices (Amoako, 2018; Asamoah *et al.*, 2019; Ntim *et al.*, 2023; Nsowah & Robyn, 2022).

At the tertiary levels in Ghana, a study by Quansah and Ankomah-Sey (2020) on pre-service teachers at tertiary institutions in Ghana revealed teachers need adequate training to assess students. Similarly, Enu & Ngcobo (2024) explored Mathematics teachers' and educators' conceptions of feedback and how their conceptions translate into practices when conducting assessments in the Mathematics module. The study revealed that teachers' feedback did not help learners to construct meaning into what is being taught. Again, Eshun's (2024) examination of formative assessment practices teacher-trainees used to assess pupils' learning in the classroom revealed different assessment practices used by teachers.

Furthermore, a notable trend in recent years is transitioning from summative to formative assessment methods to enhance student learning (ARG, 2002). Therefore, there is a global recognition for AfL in most developed countries, such as the USA, UK, Finland, Canada, Australia, New Zealand, and Singapore (Birenbaum *et al.*, 2015; Schellekens *et al.*, 2023; Volante *et al.*, 2024). One example is the Singaporean education system, which has replaced primary-level examinations with a holistic assessment approach that supports student learning (Wong et al., 2018). Therefore, students in Singapore are evaluated through classroom participation, quizzes, and homework (Bergmark & Westman, 2018). This is because AfL is a powerful tool to support students' learning in Mathematics and to develop students' problem-solving, critical thinking and analytical

reasoning process where teachers engage students in peer assessment, self-assessment, effective questioning and provision of meaningful feedback (Sahito *et al.*, 2024; Wiliam *et al.*, 2004).

Klenowski (2009) defined AfL as a "*planned process of everyday practice by students, teachers and peers that seeks, reflect upon and responds to information from dialogue, demonstration and observation in ways that enhance ongoing learning*". This implied that AfL is the minute-to-minute use of teachers' practices to support students' ongoing learning (Lysaght, O'Leary, & Ludlow, 2013). However, it is believed that teachers find it difficult to use their assessment strategies to support students' learning, and thus, students' needs are not met in the classroom (Schellenkens *et al.*, 2021). This was supported by Mahlambi *et al.* (2022), who examined mathematic teachers' role in creating a classroom culture using AfL to respond to the learning needs of grade 6 mathematics from Alexandria Township of South. The study findings revealed that teachers do not have an assessment policy to guide them in implementing AfL activities effectively. It was also shown that feedback provided by the Mathematics teachers to students does not attend to learners' individual needs to improve learners' progress. The study recommended a significant effort to assist Mathematics teachers in understanding, planning, and using their AfL practices effectively. However, there is little evidence of such an innovative approach in the Ghanaian education system on Mathematics teachers' use of AfL practices to support students' progress and better examination attainment.

This study is significantly important because: First, there are few studies on teachers' AfL practices in the Ghanaian educational system at both the basic and secondary levels. Thus, the effective use of AfL practices by teachers as stipulated in the per-tertiary curriculum framework (2018) is not effectively implemented by teachers since Takele and Melese (2022) argued that teachers' understanding of assessment influenced how teachers used their classroom practices. Secondly, this study will help teachers understand the shift from summative to formative assessment, focusing on assessment's role in student learning. Again, this study aligns with the Ghanaian National Council for Curriculum and Assessment Policy (NaCCA, 2019), which emphasized the need for teachers' use of assessment strategies to promote and support students' ongoing learning. Additionally, this study served as a foundation for teachers, educators, and other educational stakeholders to better understand teachers' use of AfL practices in the classroom. This study contributes to the existing literature on teachers' AfL practices and their impact on students' performance. AfL is widespread across many educational systems, however, few studies have examined both students' and teachers' perceptions of AfL practices supporting students' progress and examination performance.

This paper aims to contribute to the existing knowledge of teachers' AfL to support students' learning by addressing the following research questions:

1) What AfL practices do Senior High School (SHS) Mathematics teachers report using to support students' progress and better examination attainment?

2) What AfL practices do both senior high school (SHS) Mathematics teachers and senior high school students perceive as valuable in supporting students' progress and better examination attainment?

2. Literature Review

2.1 Teachers' AfL Practices

AfL is a structured process that enables teachers to collect information on students' learning, diagnose difficulties and provide needed support (Berry, 2011; Kippers *et al.*, 2018; Thompson & Goe, 2006). This requires the effective use of different practices by teachers to support students' progress (Berry, 2008; Hattie & Timperley, 2007; Kippers *et al.*, 2018) on a minute-by-minute basis (Lysaght & O'Leary, 2014). A study by Suurtamm *et al.* (2010) of Mathematics teachers' assessment practices in an inquiry-based classroom in Ontario, Canada. Their research identified fourteen formative and summative assessment practices that Mathematics teachers used in the classrooms: paper-and-pencil tests; quizzes; responses of students in class; homework performance; observations of students (notes/checklists); projects; interviews/ conferencing with students; student presentations to other students; portfolios/dated work samples; students' journals; self-assessment; computer/graphing, calculator output, demonstrations; and peer-assessment. Frey and Schmitt's (2010) examination of the classroom assessment practices of 3rd to 12th-grade teachers indicated that assessment practices were divided into traditional and performance types. The traditional classroom assessment practices are multiple-choice tests, matching questions, true-false questions, short answer/fill-in-the-blank questions, and essays. The classroom performance assessments comprised portfolios, group projects, concept mapping, presentations (e.g. debates, speeches), and writing assignments.

In addition, Havnes *et al.* (2012) explored teachers' assessment practices in six Norwegian upper secondary schools, focusing on English, Mathematics and Norwegian. Their research identifies four assessment practices teachers use in the classroom: tests or assignments, discussions with the teachers, conversations with peers, and project presentations. Also, Suah and Ong (2012) investigated the assessment practices of Malaysian in-service teachers at different teaching levels and varying teaching experiences. Using a questionnaire for 406 in-service teachers, the study categorized assessments as traditional classroom assessments (multiple-choice tests, short-answer questions, essays, fill-in-the-blanks, true-false, and matching) and alternative assessments (homework, practical work, assignments, portfolios and projects, and informal assessment practices such as oral questioning, observation, group work, interviews, and student self-ratings). Noori *et al.* (2017) explored the practices and perceptions of Afghan English Foreign Language Teachers regarding assessment, the challenges, and implementing formative assessment in their classes. The study identified the formative assessment practices of projects, exercises, assignments, classroom discussions, oral questions, homework, tests, group work, and paper-and-pencil tests.

Onyefulu's (2018) study examined the differences in the perceptions of primary and secondary school teachers' classroom assessments in Jamaica. Data were collected using a questionnaire for 157 teachers, of which 64 were primary, and 93 were secondary school teachers. The findings indicated that teachers used classroom assessment (that is, both formative and summative) practices such as peer assessment, self-assessment, closed-book tests, portfolios, multiple-choice tests, short-answer tests, restricted essays, and fill-in-the-blank tests. Sajjad *et al.* (2019) investigated the assessment practices of 235 secondary school Grade 10 English language teachers. Their study reveals that teachers used classroom assessment (that is, both formative and summative assessment) practices such as oral presentations, objective-type tests, question answering, and homework during the instruction. The research further revealed that practices such as group projects, one-minute tests, presentations, portfolios, and self and peer assessments were less used by the teachers.

In the African setting, Mekonnen (2014) investigated Ethiopian teachers' assessment techniques in their classrooms. The study employed a mixed-methods design, including analyses of questionnaires, classroom observation, and interview and lesson plans for 21 English tutors. The findings revealed 19 assessment practices, which are classified under six headings: written assessment techniques through homework and assignments, questioning and answering, teachers' observation of students' work, student effort exertion (through independent activities), giving feedback, and testing. The study shows that over 83% of English teachers used homework, answering questions, tests, and quizzes, and gave feedback to students. Yusuf's (2017) examination of secondary school teachers' classroom assessment strategies in Nigeria revealed that most teachers used papers/essays, examinations, quizzes, classroom discussions and essays to assess the students.

In Liberia, Janbo *et al.* (2020) examined the formative assessment practices in a West Arsi Zone secondary school. Their findings revealed teachers used oral questioning, oral presentations, paper-and-pencil tests, classwork activities, homework and quizzes as formative assessment strategies. Their research further reveals that students preferred oral questions, paper-and-pencil tests, homework, quizzes, individual assignments, and classroom activities based on teachers' practices. However, their findings indicated that teachers underutilized formative assessment methods, including self and peer assessments.

In Ghana, Amoako (2018) investigated the formative assessment practices of 150 Distance Education course tutors in Ghana using questionnaires, revealing that the standard practices of the course tutors are using oral questioning, peer assessment and student self-assessment. Further studies (Akyina & Okyireh, 2019; Buabeng *et al.*, 2019; Okyere & Larbi, 2019) have shown that self-assessment, class tests, peer-assessment questions, answering questions from students, observation, journal writing, self-assessment and quizzes were the common assessment practices of Mathematics teachers. The study recommended that the Ghana Education Service (GES) pay particular attention to teachers' classroom assessment practices.

Another study in Ghana by Asare (2020) on basic teachers' perceptions and formative assessment practices revealed that the dominant formative practices of the teachers were classroom participation, discussion feedback with students, use of questions, answering questions during instruction, giving homework to students, and role play engagement of students. A similar study in Ghana by Dah and Dognia (2022) on the activities and practices of 200 senior high school students and 2 physics teachers showed that oral questioning and answers, homework, class exercises, class tests, peer assessment and self-assessment were the common assessment practices. Oral questions, homework and class exercises were the major formative assessment practices of the physics teachers, while peer and self-assessment were less used. All these research works required students' involvement and teachers' use of AfL to support students' ongoing learning (ARG, 2002; Klenowski, 2009).

2.1 Students' Perceptions of Teachers' Assessment for Learning Practices

AfL is a process in which teachers, together with students, are responsible for goal setting, data collection, and follow-up processes in the classroom, where students are crucial in the learning process (Klenowski, 2009). Therefore, AfL involves the active participation of the students in the learning process to improve their learning with peers and their teachers (Sachildkamp, 2019). Thus, teachers are responsible for the design and implementation of AfL practices where students benefit from the learning outcomes (Lynam & Cachia, 2018) and are the owners of their learning through peer assessment and self-assessment (Stobart, 2005). In addition, students require knowledge from teachers for effective use of self and peer assessments to provide useful feedback to teachers (Heitink *et al.*, 2016). However, teachers and students hold different perceptions of AfL (Pat-El *et al.*, 2015; Wolterinck-Boekhuis *et al.*, 2024). For example, Wolterinck-Boekhuis *et al.* (2024) examined students' perceptions of AfL practices in their classroom using 685 secondary school students in the Netherlands. The findings revealed AfL is not fully integrated within the daily classroom activities by teachers and that there is a need for improvement. The study further indicated that from the students' perspective, teachers underutilised feedback to students' learning, and self-assessment and peer-assessment were least used by teachers. Further, in a study conducted in Canada, DeLuca *et al.* (2018) administered a questionnaire to 1231 secondary school students, followed by interviews for 12 selected students to examine students' perspectives on the use of and value of AfL pedagogical approach within their learning. The study revealed that teachers' feedback to students was the most helpful approach to students' learning.

3. Methods

3.1 Study Participants

The wider study from which this paper is drawn received institutional approval from the University of Tasmania Social Sciences Human Resources Ethics Committee and the selected Districts and Municipal Directors of Education in Ghana. Two different sets of

questionnaires were used for senior high school Mathematics teachers and senior high school students. The study was conducted in 20 public senior high schools in six districts in the Ashanti region of Ghana. A total of 728 participants–308 Mathematics teachers and 420 students took part in the study. The Mathematics teachers were selected using simple random sampling techniques where all the Mathematics teachers in the selected districts participated in the study. The students were purposively selected from senior high schools three and two because they have been assessed for two years, and they are aware of Mathematics teachers' AfL practices.

The first author contacted the heads of the various senior high schools and was directed to the assistant academic heads, heads of the Mathematics department, and the Mathematics teachers in the selected schools. The various Mathematics teachers also invited the students in consultation with the heads of the Mathematics department. For ethical reasons, the students are 18 years of age selected from different programmes offered by the schools. For those students who were below the age of 18 years, the Mathematics teachers in the various senior high schools acted as parents since their parents had mandated them to act on their ward's behalf.

3.2 Instruments

The two sets of questionnaires were developed based on the gaps identified in the literature and the emerging themes outlined for both senior high school Mathematics teachers and senior high school students. Both teachers' and students' questionnaires were adapted from Lysaght and O'Leary (2013) and Pat-El *et al.* (2013) with a few changes made from the questionnaires based on the pilot study. Both teachers' and students' questionnaires were piloted for 100 senior high school students and 15 Mathematics heads of the department who are experienced Mathematics teachers in charge of the classification of Mathematics teachers in the various senior high schools. The teachers' questionnaire consisted of both open-ended and closed-ended questions categorized into two sections of 19 items.

The first part (that is, A) was open-ended questions on teachers' demographic information such as gender, age, academic qualification, category of the school, teaching experience and professional qualification. The second section (Part B) comprised 12 items on teachers' assessment practices for students' progress and better examination attainment. However, the students' questionnaire was in two sections. Section A on participants' demographic data such as gender, age, the course offered, category of school and level in the school.

Section B consists of 12 items on students' perceptions of teachers' assessment practices to support their progress and better examination attainment. The 12 items were measured on a 5-point Likert scale ranging from not at all helpful to extremely helpful.

Both teachers' and students' questionnaires were administered personally by the first author at the same time in all the selected schools during the COVID-19 pandemic period where the first author observed all the COVID-19 protocols. Both questionnaires

were in the English Language because it is the medium of instruction used in senior high schools in Ghana.

The authors calculated Cronbach's alpha to check the internal consistency of the instruments with the following results: teachers' AfL practices for students' progress and better examination attainment (0.87) and students' perception of AfL practices for students' progress and better examination attainment (0.90) (DeVellis, 2012). Out of the 520 questionnaires distributed to senior high school students, 420 were returned, representing a return rate of 82.6% for the data analysis. For the teachers, out of the 400 questionnaires, 308 were returned, representing 77 % for the data analysis. Table 1 presents a summary of the demographic characteristics of the participants.

3.3 Data Analysis

The data were entered and analysed using the Statistical Package for the Social Sciences (SPSS), version 27. The quantitative data gathered from the questionnaires of both teachers and students were analysed using means, standard deviations, and rank correlation.

To answer Research Question 1, the teachers' data were analysed using the mean and standard deviation of the teachers' AfL to support students' progress and better examination attainment.

To answer Research Question 2, both the students' and teachers' data were analysed using mean, standard deviation and correlation. Again, after calculating the mean and standard deviation for both students and teachers, the practices from both students and teachers were ranked in terms of the mean. While assuming that the data were normally distributed because of the large sample size (Field, 2013).

4. Results

The questionnaire asked the teachers to identify the common AfL practices they used to assess students' progress and better examination attainment. A five-point Likert scale was used, ranging from 1 (not used) to 5 (used very often). The mean and standard deviation were calculated for teachers' common assessment practices to assess students' learning progress and better examination attainment. As seen in Table 2, Research Question one was answered by calculating the mean and standard deviation of each of the teachers' AfL practices used to support students' progress and better examination attainment in the classroom. The highest mean was questions (mean = 4.41), followed by quizzes (mean = 3. 82), homework/assignment (mean = 3.76) and paper and pencil test (mean= 3.58). These were the preferred teachers' AfL practices to support students' progress and better examination attainment. Self-assessment (mean = 3.00), peer assessment (mean = 2.93) and portfolio (mean = 2.78) have the lowest means, and these are the least preferred teachers' AfL practices for students' progress and better examination attainment.

Table 1: Showing the Demographic Information of Both Mathematics Teachers and Senior high School Students

Students Categories (N = 420)		**Teachers Categories (N = 308)**	
	Sample (%)		**Sample (%)O**
Gender		**Gender**	
Male	203 (48.3%)	Male	257 (83.4%)
Female	217 (51.7%)	Female	51 (16.6%)
Senior High School Level		**Teaching Experience**	
SHS2	160 (38.1%)	1-5 years	82 (26.6%)
SHS3	260 (61.9%)	6-10 years	72 (23.4%)
		11-15 years	102 (33.1%)
		16-20 years	30 (9.8%)
		21 years and above	22 (7.1%)
School Location		**School Location**	
Municipal	280 (66.7%)	Municipal	188 (61.4%)
District	140 (33.3%)	District	120 (38.6%)
Age in years		**Ages in Years**	
17	100 (23.8%)	20-25	52 (16.9%)
18	300 (71.4%)	26-30	73 (23.7%)
19	20 (4.8%)	31-35	84 (27.3%)
		36-40	61 (19.8%)
		41 and above	38 (12.3%)
Courses Offered		**Academic Qualification**	
Science	224 (53.3)	Bachelors	226 (73.4%)
General Arts	106 (25.2%)	Master	38 (12.3%)
HE/VA/Tech.	59 (14.1%)	Doctorate	1 (0.3%)
Business	31 (7.4%)	Other Qualifications	43 (14.0%)

In addition, these practices were ranked in order based on the mean of usefulness to support students' progress and better examination attainment. The finding shows that questions were ranked first, followed by quizzes, homework, paper and pencil tests, classroom discussions, group work and in order (see Table 2 for details).

Table 2: Mean and Standard Deviation of Teachers' Perception on AfL Practices for Students' Progress and Better Examination Attainment

No.	**Assessment Practices**	**Mean**	**Standard Deviation**	**Teachers' Rank (T_R)**
1	Questions	4.41	0.81	1
2	Quizzes	3.82	1.12	2
3	Homework/assignment	3.76	1.52	3
4	Paper-and-pencil test	3.58	1.21	4
5	Classroom discussion	3.50	0.92	5
6	Group work	3.32	1.41	6
7	Oral presentation	3.27	1.04	7
8	Student observation	3.21	1.17	8
9	Student demonstration	3.11	1.67	9
10	Self-assessment	3.01	1.51	10
11	Peer-assessment	2.93	1.43	11
12	Portfolios	2.78	1.71	12
Mean of means = 3.39				

Note: Not at all helpful (1.0-1.80), Not helpful (1.81-2.60), Somewhat helpful (2.61-3.40), Very helpful (3.41-4.20) and extremely helpful (4.21-5.0)

Research Question Two was answered by finding the mean of teachers' use of AfL practices for students' learning progress, which was calculated and ranked. In addition, the mean of students' perspectives of teachers' AfL practices for students' progress and better examination attainment was calculated and ranked for comparison. The results reveal that students and teachers ranked questioning, quizzes and homework high. This shows that questions (R_T = 1 with R_S = 2), quizzes (R_T = 2 with R_S = 1) and homework (R_T = 3 with R_S = 3) are most often used by teachers and most preferred by students as very supportive for students' progress and better examination attainment. In addition, there was disagreement from both students' and teachers' responses in terms of teachers' assessment practices for students' progress and better examination attainment. For instance, the students preferred student observation (R_S = 4 and R_T = 8) and oral presentation (R_S = 7 and R_T = 12), which were not often used by the teachers. Similar results were revealed from both students' and teachers' rankings for classroom discussion (R_T = 5 and R_S = 11) and paper and pencil tests (R_T = 4 and R_S = 6). Additionally, both students and teachers ranked portfolios and self-assessments among the least preferred AfL practices for supporting students' progress and examination attainment (see Table 3). Finally, there was a similar ranking between teachers and students in terms of teachers' practices for student progress and better examination attainment. For instance, homework was ranked as 3rd (R_T = 3 and R_S = 3) by both teachers and students (see Table 3 for details).

Table 3: Both Senior High School Teachers and Students Preferred Teachers' AfL Practices for Students' Progress and Better Examination Attainment

SN	Frequency of Teachers' AfL	Teachers' Perspective of AfL Practices for Students' progress and better examination attainment		Students' Perspective of AfL Practices for their Progress and Better Examination Attainment	
		Mean	Rank R_T	Mean	Rank R_S
1	Questions	4.42	**1**	4.30	**2**
2	Student observation	3.21	**8**	4.06	**4**
3	Classroom discussion	3.50	**5**	3.62	**11**
4	Quizzes	3.82	**2**	4.33	**1**
5	Paper-and-pencil Test	3.58	**4**	3.98	**6**
6	Oral presentation	3.27	**7**	3.32	**12**
7	Student demonstration	3.11	**9**	3.94	**7**
8	Group work	3.32	**6**	4.01	**5**
9	Homework/ Assignment	3.76	**3**	4.10	**3**
10	Peer-assessment	32.93	**11**	3.91	**8**
11	Self-assessment	3.00	**10**	3.79	**9**
12	Portfolios	2.78	**12**	3.71	**10**

4. Discussion

Even though teachers used different AfL practices to assess students' learning in the classroom, the study findings revealed that questions, quizzes, homework/ assignments, paper and pencil tests and classroom discussions were the most used practices of teachers to support students' learning and better examination attainment. This finding aligns with the findings of Kippers *et al.* (2018), who found the same most frequently used teachers' assessment practices in the classroom. A similar study by Nsowah and Robyn (2022) revealed that questions, quizzes and classroom discussions were Mathematics teachers' most frequently used practices to assess students' learning. However, there are some differences in terms of AfL practices most frequently used to support students' progress and better examination attainment. Further, the study finding contradicts previous research by Osman (2021) in Ghana, where class exercises, oral questions, homework, class tests and oral presentations were the most frequently used assessment practices of teachers in the Ghanaian classroom. In addition, Osman's study was conducted for basic schools (primary and junior high schools) where teachers used these practices to memorise facts, principles, procedures and processes. However, teachers used their AfL practices at the senior high school level to stimulate students' mathematical concepts and promote problem-solving approaches in the learning process (Suurtamm *et al.*, 2010; Yan & Pastore, 2022). Therefore, the AfL practices of senior high school teachers go beyond students' memorization of facts, principles and processes to the application of students' mathematical understanding in real-life situations (National Council Teachers of Mathematics, 1995).

In addition, the study contradicts Takele and Melese's (2022) study of Mathematics teachers in Ethiopia, where more than half of the teachers who took part in the study used formative and summative assessment practices such as homework, paper-and-pencil tests, class, and oral tests to assess students' learning. Researchers (Onyefulu, 2018; Suah & Ong, 2012) have referred to these practices as formative and summative assessment practices preferred by teachers. Teachers' preference for these assessment practices in the Ghanaian classroom could be due to the nature of Mathematics questions used to assess students in the external examination conducted by the West African Examination Council (WAEC). A study by Dogbey and Dogbey (2018), conducting a content analysis of West Africa Secondary School Certificate Examination (WASSCE) Core Mathematics, reveals that the external examination assesses basic applications of concepts that require the recall of information and straightforward, routine procedures. WAEC's aim could be to ensure high Mathematics pass rates to satisfy parents, stakeholders, and policymakers, a key concern for parents and schools (Amoako, 2018).

Further, the study shows that both students and teachers perceived those questions, quizzes, and homework were the most used and supportive AfL practices for students' progress and better examination attainment. This finding is a novelty in the literature and provides evidence to teachers that students achieved better examination attainment when teachers used questions, quizzes and homework to assess students'

learning (Brown & Hirschfeld, 2008). These findings also give further evidence to the importance of Dhindsa *et al.*'s (2007) suggestion that teachers should consult students in the planning and implementing assessment practices to allow students to appreciate teachers' effective use of AfL practices.

The present study, thus, provides information to teachers to consider students' perceptions of teachers' AfL practices and professional development for teachers to enhance their effective use of AfL practices for students' progress and better examination attainment. This study's results offer valuable insights for Ghanaian teachers to improve their AfL strategies and boost student learning, unlike prior research (e.g., Akyina & Okyireh, 2019). Thus, this study provides information for the National Council for Curriculum and Assessment (NaCCA) in Ghana to re-orient teachers' professional development to ensure that learners are at the centre of teachers' use of AfL practices in the classroom.

5. Conclusion and Recommendations

Despite the growing trend for and the importance of AfL in the educational policy of many countries (Birenbaum *et al.*, 2015; Klenowski *et al.*, 2009; Volante *et al.*, 2024; Schellekens *et al.*, 2021; Swaffield, 2011) which has been advocated by researchers for many years (e.g., Wiliam, 2011), there are few studies on students' perceptions of teachers' AfL practices (Dhindsah *et al.*, 2007; Gao, 2012; Pat-El *et al.*, 2014). The few studies have focused on students' perception of teachers' AfL practices (Nsowah & Robyn, 2021); students' formative assessment perceptions, feedback use and Mathematics performance (Kyaruzi *et al.*, 2019); and students' perspective on AfL (DeLuca *et al.*, 2018). This study contributed to the literature on both teachers' and students' use of AfL practices to support students' progress and better examination attainment.

The study provides implications for the design of teacher education programs, which have a direct relationship with the limited classroom assessment literacy of the instructors (Buabeng *et al.*, 2020; Enu, 2020) since it is highlighted in the previous research of (Figa *et al.*, 2020; Kippers *et al.*, 2018) of lack of knowledge about assessment among teachers. This suggests that Ghanaian teacher education programmes need to devote more time and attention to teaching effective assessment practices and developing assessment literacy. The findings presented in this study suggest that policymakers should consider providing stand-alone educational assessment subjects rather than assessments being embedded within other subjects. These assessment-focused subjects should be treated as a core component and be taught in-depth within the teacher education programme. In so doing, student teachers should be provided with sufficient learning time to acquire in-depth knowledge, skills, and understanding adequately by linking theoretical underpinnings of the assessment process with actual assessment practices.

There is a current drive in Ghana to shift from an emphasis on summative assessment (AoL) towards AfL, which is strongly advocated by the Assessment Reform Group (2002) and many developed countries such as Australia, Canada, England, Singapore and the USA, which have already highlighted the importance of AfL in their education system (Birenbaum *et al.*, 2015; OECD, 2023; Volante *et al.*, 2024). This study provides baseline information to promote the use and implementation of AfL in Ghana since it is advocated by the Ministry of Education for teachers to practice AfL in the classroom (Ministry of Education, 2018).

Finally, the study's conclusions align with existing research advocating for AfL's role in improving learning outcomes (Wiliam, 2011; Birenbaum *et al.*, 2015). However, it also identifies gaps in previous studies, such as the limited exploration of students' perceptions and the lack of baseline information on teachers' AfL practices in Ghana. By addressing these gaps, the study contributes to the literature and offers practical recommendations for teacher training programs. The emphasis on professional development is particularly relevant, as prior research (Buabeng *et al.*, 2020; Enu *et al.*, 2015) has shown that teachers' assessment practices significantly influence student performance.

5.1 Limitations

Despite its contributions, the study has some limitations. While it provides valuable insights into AfL practices, it relies solely on self-reported data from teachers and students, which may introduce response bias. Additionally, the study focuses on one region of Ghana, which limits the generalizability of its findings to the entire country. Future research could benefit from a mixed-methods approach, incorporating classroom observations and interviews to triangulate the findings. A comparative analysis with other regions or countries could also offer a broader perspective on the effectiveness of AfL in diverse educational contexts.

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Conflict of Interest Statement

The authors declare no conflicts of interest.

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