




Ghanaian senior high school mathematics teachers' beliefs about assessment purposes and practices: A mixed method approach



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ABSTRACT

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Assessment is an integral aspect of teaching and learning, and its importance cannot be overemphasized; however, effective assessment relies heavily on teachers' practices. The effective use of assessment practices in the classroom is influenced by teachers' beliefs about the purposes of assessment. Studies have indicated a positive relationship between teachers' beliefs regarding assessment purposes and their assessment practices aimed at supporting students' learning. Although there are studies on teachers' beliefs about assessment purposes in Ghana, there are few studies focusing on mathematics teachers' beliefs about assessment and their practices, especially when compared to developed countries. The study explored senior high school Mathematics teachers' beliefs about assessment purposes using a questionnaire administered to 308 senior high school Mathematics teachers, followed by interviews with 15 teachers from the Ashanti Region of Ghana. The findings indicated that teachers primarily believed assessment served purposes related to student accountability, school accountability, and improvement. However, further interviews revealed that teachers' definitions of assessment, along with their perceptions of improvement and accountability, influenced their use of assessment practices to support students' learning. The study highlights the importance of understanding teachers' perceptions of assessment and how these perceptions shape their instructional practices, ultimately impacting student learning outcomes. The study offers practical applications for teachers' assessment practices in the classroom, provides policy guidelines for the Ministry of Education, and recommends professional training for Mathematics teachers on how their beliefs influence their assessment practices in Ghana.

Contribution/ Originality: The study contributes to the literature on Mathematics teachers' beliefs about assessment purposes, examining how these beliefs influence their assessment practices and the practical application of these practices in the classroom.

1. INTRODUCTION

In education, assessment is an integral part of teaching and learning, serving two main purposes: summative and formative (Assessment Reform Group, 2002; Scriven, 1967; Taras, 2005). The primary purpose of summative assessment is to provide a final evaluation at the conclusion of a program (Berry, 2011; Scriven, 1967; Williams-

McBean, 2024). The summative assessment served the purposes of accountability, ranking and certifying competence by the judgment of students' achievement (Crooks, 2010), and this is also known as Assessment of Learning (Assessment Reform Group, 2002). It is worth mentioning that, internationally, there is a recognizable transition from summative to formative assessment methods and practices to enhance effective students' learning (Assessment Reform Group, 2002). The formative assessment supports and improves students' learning and this is referred to as Assessment for Learning (AfL) (Alberta Education, 2008; Earl, 2003; Swaffield, 2011). AfL is the process of interpreting evidence for learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there (Assessment Reform Group, 2002; Klenowski, 2009), and it is a powerful tool to develop students' problem-solving, critical thinking and analytical reasoning processes in Mathematics (Sahito, Özer, Abro, & Junejo, 2024; Schellekens et al., 2021).

In Ghana, for instance, there is currently a conscious drive 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 United States of America have already highlighted the importance of AfL in their education system (Birenbaum et al., 2015; Volante et al., 2024).

Although there are significant benefits associated with the implementation of AfL practices in teaching and learning, these practices are often not adhered to in real classroom settings due to several identifiable factors. These factors include teachers' beliefs, as well as their knowledge and skills (Yan et al., 2021). The literature suggests that teachers' beliefs about the purposes of assessment to a great extent influence how assessment is implemented in a typical classroom setting (Remesal, 2011) for both formative and summative purposes. This is why researchers (Barnes, Lucianetti, Bhave, & Christian, 2015; Brown, Andersson, Winberg, Palmberg, & Palm, 2024) have reviewed literature on teachers' beliefs about the purposes of assessment. For example, Brown (2008) developed a framework based on four purposes of assessment: improving teaching and learning (improvement), holding schools and teachers accountable for their effectiveness (school accountability), making students responsible for their learning (student accountability), and assessing irrelevance to teachers and students (irrelevance). The purpose of assessment for improvement involves determining what students have learned, measuring students' achievements in the learning process, assessing students' higher-order thinking skills, and making adjustments to the learning process to benefit students. Additionally, teachers provide feedback to students regarding their performance based on their learning needs. The school accountability purpose evaluates the quality of a school, with assessment serving as an accurate indicator of school effectiveness, a useful tool for evaluating school performance, and providing information on how well a school is functioning. Student accountability focuses on grading, categorizing, and evaluating students by providing information about their learning progress, with grades assigned based on established qualification standards. Conversely, the irrelevant purposes of assessment suggest that assessment is not considered important by both students and teachers, and that assessment results are not accepted or valued by either group.

Further, teachers' conceptions and use of assessment have been researched in other countries (Brown et al., 2024; Gebril & Brown, 2014; Quainoo, Kibi, Sundeme, & Brew, 2023), the cultural differences across the globe make it difficult to apply teachers' conceptions in one country to another due to local factors such as high stakes examination, school authorities and the context in which the teacher works which makes it difficult to transfer research findings from one country to another country.

In Ghana, there are few studies on teachers' beliefs about assessment purposes compared to studies in developed countries. For instance, Yidana and Anti (2018) studied 301 secondary school Economics teachers about assessment purposes using a 56-item version of the Teachers' Conception of Assessment Inventory Scale. The study identified three beliefs about assessment purposes: student accountability, improvement of teaching and learning, and school accountability. The teachers rejected the irrelevant conception of assessment. However, this study collected data from Economics teachers in Ghana without ascertaining a deeper understanding of how teachers' beliefs and assessment practices are related in classroom practices. Another study in Ghana by Osman, Bordoh, and Eshun (2021) for basic

school teachers' to determine their conceptions of assessment in Ghana, using questionnaire for 203 teachers followed by interviews with 12 teachers. The improvement, student accountability, and school accountability were the beliefs about assessment purposes of the basic school teachers in Ghana.

Research has indicated that teachers' assessment practices are influenced by the subjects of teaching (Duncan & Noonan, 2007; Vandeyar & Killen, 2007; Zhang & Burry-Stock, 2003), which are closely related to teachers' assessment practices as indicated in the conceptions of classroom assessment (Dayal & Lingam, 2015). This is why Bright and Joyner (1998) posited that the nature of the subjects handled by teachers could influence their conceptions about classroom assessment. Even though there is literature on teachers' beliefs about assessment purposes in Ghana, research specifically concerning mathematics teachers regarding their beliefs about the purposes of assessment and how these beliefs influence their classroom assessment practices is lacking and unexplored.

This study fills the knowledge gap regarding Mathematics teachers' beliefs about the purposes of assessment and how these beliefs influence their classroom practices. Data were collected through questionnaires for teachers and interviews with selected teachers. This research contributes to the literature on Mathematics teachers' beliefs about assessment purposes and how these beliefs affect their assessment practices. It also emphasizes the importance of these elements for the improvement of teachers' practices, which are essential components of assessment literacy (Latif & Wasim, 2022).

This study examines mathematics teachers' beliefs about assessment purposes and how their assessment purposes influence their classroom practices by addressing the research questions:

1. What are senior high school Mathematics teachers' beliefs about the purposes of assessment in the classroom?
2. How do teachers' beliefs about the purposes of assessment influence their assessment practices in the classroom?

2. LITERATURE REVIEW

2.1. The Context of the Study

Ghana, a developing country located in the western part of Africa, has an estimated population of 30.8 million people, with a slightly higher number of females estimated at 15.6 million, representing 50.7% of the population, and males estimated at 15.2 million, representing 49.3% of the population (Ghana Statistical Service, 2022). Ghana has been divided into 16 regions for political administration with a total size of 22,754,000 hectares (Ghana Statistical Service, 2022). Ghana shares boundaries with Togo, located in the east; Ivory Coast to the west; Burkina Faso to the north; and the Atlantic Ocean to the south. Regarding education, Ghana has a three-tier education structure consisting 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 education and 2-4 years of tertiary education (Ministry of Education, 2022). Education is nationally controlled by the Ministry of Education, and students across all regions are selected into senior high schools in Ghana based on the results obtained at the Basic Education Certificate Examination.

There are two types of assessments conducted at each level of education in Ghana by the West African Examination Council (WAEC). The WAEC conducts the first assessment at the end of junior high school education for all pupils at the basic level (Dogbey & Dogbey, 2018). This assessment is termed the Basic Education Certificate Examinations (BECE) for the purpose of selection and placement of students from the basic level to the senior high school, senior high technical, and vocational schools in Ghana. The second type of assessment is where external examinations are conducted for senior high school students at the end of their three years of education for the selection and placement of students into any tertiary institution in Ghana (Anane, 2015; Dogbey & Dogbey, 2018). These external assessments are of high stakes (Baird, Andrich, Hopfenbeck, & Stobart, 2017; Stobart & Eggen, 2012).

For the senior high school mathematics curriculum, there are other internal assessments which are applied by teachers to support the external summative assessment. These are diagnostic and formative assessments. Diagnostic assessment is where teachers identify learners' current knowledge, skills, and abilities to clarify misconceptions after

the introduction of a new learning area. The information gathered from a diagnostic assessment enables teachers to plan what is to be taught, how to be taught, and where to be taught (Ghana Education Service, 2018). On the other hand, the formative assessment is used to provide feedback and information during a teaching and learning process to ensure learners' progress through teachers' lesson delivery (Berry, 2008; Black & Wiliam, 1998; Kyaruzi, Strijbos, Ufer, & Brown, 2018).

There have been various reforms in Ghana's educational system to improve the curriculum of the country, but there are still challenges with assessment in the current curriculum. The current curriculum was last reviewed in 2010, and fundamental concerns and challenges were identified that inhibit learners' opportunities to experience the education programs and practices that will enable them to contribute to the transformation of Ghanaian society (Ghana Education Service, 2018). Some of these concerns are due to the lack of performance standards to guide the teaching, learning, assessment, and grading of learners. In addition, the assessment system does not provide effective data on examination outcomes for evaluating teaching and learning in order to improve the quality of pre-tertiary education. Moreover, the World Bank (2013) Systems Approach for Better Education Results (SABER) study posits that classroom assessment practices in Ghana are generally weak and that the mechanisms in place to monitor the quality of assessment are limited. This has led to the review of the 2018 Pre-tertiary curriculum.

The Ghana Education Service (2018) also recommends that changes be made in teachers' assessment, in particular, a shift from summative assessment to formative assessment (p. 19). In 2018, a review of the pre-tertiary curriculum identified that assessing pupils' progress in learning is one of the problem areas that need attention, and it was stated that all teachers in the various training institutions should be trained in the area of assessment. One particular distinction in this respect is between teachers' summative assessment practices that primarily focus on Assessment of Learning (AoL), and formative assessment practices with a focus on Assessment for Learning (AfL). One of the factors is the lack of baseline information about teachers' beliefs about assessment purposes, as Opre (2015) proposed the relationship between conception and practices in three ways: conception influences practices, practices influence conception, and conception and practice are interconnected.

The conception of assessment refers to one's beliefs associated with assessment (Brown, 2008; Fletcher, Greenwood, & Oliver, 2012), and there are different beliefs about assessment purposes. For instance, researchers (Brown et al., 2024) have indicated different purposes of assessment as informing performance and learning, holding schools accountable, holding students accountable and irrelevant to students and teachers. Another study by Gebril and Brown (2014) on teacher beliefs about the purposes of assessment indicated four purposes of assessment: improvement, school accountability, student accountability, and irrelevance.

Further study by Brown et al. (2024) examined 249 Swedish teachers' conceptions of assessment using the New Zealand teachers' conception of assessment inventory, revealing three purposes of assessment: irrelevance (assessment is detrimental to teaching and often ignored), school quality (assessment used to judge the quality of schools), and improvement purposes for both teachers and students, which provide diagnostic descriptions of students' performance. Contrary to a study by Monteiro, Mata, and Santos (2021) involving Portuguese teachers and students' conceptions of assessment, with 5 teachers and 82 students using interviews and focus groups for the teachers, the findings revealed that both students and teachers hold two beliefs about assessment: AoL, with a focus on certification and accountability, and AfL, with a focus on improving learning. In Estonia, a study by Rosin, Vaino, Soobard, and Rannikmäe (2022) examined science teachers' beliefs about teaching and assessment using questionnaires for 319 Estonian science teachers in both lower and upper secondary schools, indicating four beliefs: teaching improvement, irrelevance, examination, and school and teacher accountability. A similar study by Brown, Hui, Yu, and Kennedy (2011) for Chinese and Hong Kong teachers identified three purposes of assessment: accountability, improvement, and irrelevant purposes. Further, a study examining teachers from New Zealand and Spain (New Zealand, number = 324; Spain, number = 672) using Brown (2008) model indicated five beliefs about assessment purposes: improving

student learning, student accountability, school accountability, irrelevance, and inaccuracy. The literature reveals inconsistency in teachers' beliefs about assessment purposes.

In Ghana, Brown (2008) conception tool has been applied in research by Osman et al. (2021) to examine teachers' beliefs about assessment purposes at the basic level using a mixed-method approach of a questionnaire for the teachers followed by interviews. The study findings revealed positive conceptions of assessment as a means for ensuring student and school accountability as well as improving teaching and learning, with assessment for student accountability being the most widely believed by the teachers. Further, Yidana and Anti (2018) also applied Brown (2008) conception tool to explore Senior High School (SHS) Economics teachers' conceptions of the purposes of classroom assessment. The study further examined the influence of the Economics teachers' demographic variables such as age, gender, and teaching experience on their conceptions of classroom assessment using a questionnaire for 301 teachers. The study's findings indicated that the majority of the Economics teachers believe that improvement in teaching and learning, school accountability, and students' accountability to their own learning are important. In addition, for age and gender, the study revealed no significant differences in the respondents' conceptions of classroom assessment.

This study applied Brown (2008) conception tool to measure senior high school mathematics teachers' conception about assessment. Brown (2008) tool grouped the purpose of assessment into four main categories as follows: (a) assessment improves teaching and learning (improvement purposes); (b) assessment makes students accountable for their learning (student accountability); (c) assessment makes schools accountable through (school accountability); and (d) assessment is irrelevant to the work of teachers and the life of students (irrelevance purposes). Thus, Brown (2008) conception about the purposes of assessment was applied for this study to determine Mathematics teachers' beliefs about the purpose of assessment.

2.2. Teachers' Beliefs about Assessment Purposes and Practices

Research indicated that teachers' beliefs about assessment purposes influence practices (Barnes et al., 2015), where the improvement purposes of assessment lead to the formative use of assessment, and the accountability conception of assessment leads to summative use of assessment (Takele & Melese, 2022).

Williams-McBean (2024) study of Jamaican English teachers' conceptions of assessment and how their conceptions affect their use of assessment practices revealed congruence between teachers' conceptions and assessment use. The study indicated that behaviour management was the most frequently observed, despite being the third most prevalent conception. The improvement conception was the most commonly reported but the second most frequently observed in practice. The student accountability conception ranked as the fourth most prevalent, yet it was observed with the third highest frequency. In contrast, the school accountability conception was the second most prevalent but was minimally observed in practice.

3. METHODOLOGY

Pragmatism was chosen as a philosophical paradigm for this study due to its ontological, epistemological, and methodological compatibility with the mixed methods (quantitative and qualitative) research approach adopted by the researcher in examining Mathematics teachers' beliefs about assessment purposes and practices. Pragmatists advocate for the use of mixed methods as a practical way to understand human behaviors (Kivunja & Kuyini, 2017). In addition, pragmatism is suggested as a suitable paradigm for the present research because it is problem-centred and is oriented to real-world practice, consistent with the research questions (Mackenzie & Knipe, 2006). The reason for using a mixed method was to gather a deeper understanding of the results obtained from the first phase (Creswell & Clark, 2018). Moreover, the questionnaire provided insight into teachers' beliefs about assessment purposes, while the interviews explained and elaborated on the extent to which these beliefs influenced their use of AfL practices to support students' learning.

This study involves a sequential explanatory mixed-method approach, where questionnaires were completed by senior high school Mathematics teachers in the first phase, followed by interviews with selected Mathematics teachers who participated in this phase.

3.1. Participants

A total of 308 senior high school Mathematics teachers were purposively selected from 20 public schools in the Ashanti Region of Ghana to participate in the first phase of the study. The twenty senior high schools were selected from six districts in the Ashanti Region of Ghana as follows: Mampong (4 schools with 69 teachers), Mampongteung (4 schools; 65 teachers), Sekyere South (4 schools, 65 teachers), Sekyere East (4 schools, 55 teachers), Ejusi (3 schools, 34 teachers), and Juaben (1 school, 20 teachers). The demographic information of the teachers who took part in the study is indicated in Table 1. The interviews in the second phase involved 15 Mathematics teachers who were randomly selected from among the 308 senior high school Mathematics teachers that voluntarily participated in the first phase of the study (see Table 2 for details).

Table 1. The demographic information of the participants for the quantitative phase.

Items	Frequency (%)
Gender	
Male	257 (83.4%)
Female	51 (16.6%)
Age range	
20-25	52 (16.9%)
26-30	73 (23.7%)
31-35	84 (27.3%)
36-40	61 (19.8%)
41 and Above	38 (12.3%)
Academic qualification	
Bachelor	226 (73.4%)
Master	38 (12.3%)
Doctorate	1 (0.3%)
Other Qualifications	43 (14.0%)
Teaching experience	
1-5 years	82 (26.6%)
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%)

3.2. Procedure

The study from which this paper is drawn received institutional approval from the Social Sciences Human Resources Ethics Committee and the selected District Directors of Education in Ghana prior to data collection. This research is part of a larger study that explored mathematics teachers' AfL practices in senior high schools in the Ashanti region of Ghana (Nsawah, Yeboah, Osei, Nimoh, & Agyeman, 2025). The principals, assistant academic principals, heads of Mathematics departments, and Mathematics teachers in the selected schools were contacted by the first author and invited to participate. The teachers' questionnaire was administered personally by the first author simultaneously in all the selected schools during the COVID-19 pandemic in 2022, observing the COVID-19 protocols. The questionnaire was in English because it is the medium of instruction used in senior high schools in Ghana.

In the second phase, interviews were conducted personally by the first author. The total duration of the interviews was 280 minutes (4 hours and 40 minutes). The participants were assigned codes based on their teaching experience and their positions at the senior high schools.

3.3. Instruments

3.3.1. Quantitative Phase

3.3.1.1. Questionnaire

The questionnaire was adopted from Brown (2008) Teachers' Conception of Assessment Tool (TCoA) with few additions based on the gaps and emerging themes identified in the literature. Although the questionnaire had been used in previous studies in Ghana, 20 experienced mathematics teachers and three other experts in assessment were invited to provide feedback on the wording and organization of the items. The questionnaire included both open-ended and closed-ended questions categorized into two sections of 8 items in total. The open-ended questions in the first section (Part A) gathered teachers' demographic information with four items regarding gender, age, academic qualification, and teaching experience. The second section (Part B) consisted of four items on teachers' beliefs about assessment purposes (see Table 2) measured on a five-point Likert scale, ranging from *strongly disagree* to *strongly agree*. The questionnaire for teachers' beliefs about assessment purposes has four domains of conceptions of assessment: improving teaching and learning (improvement); making students accountable for their learning (student accountability); making schools accountable (school accountability); and viewing assessment as irrelevant to teaching and learning (irrelevant). A five-point Likert scale was used, ranging from 1 (strongly disagree) to 5 (strongly agree).

The reliability of the questionnaires was initially assessed using the results of a pilot test conducted with ten teachers from the senior high school who were not part of the main study. The Cronbach's alpha was used to evaluate the internal consistency of the instruments (DeVellis, 2012), with teachers' beliefs about the purposes of assessment, indicating a high reliability correlation of 0.88. For the teachers, out of the 400 questionnaires distributed, 308 were returned, representing a 77% response rate for the data analysis.

3.3.2. Qualitative Phase

3.3.2.1. Semi-Structured Interview

The researchers designed semi-structured interview questions to determine diverse views on how Mathematics teachers' beliefs about the purpose of assessment influence their assessment practices in the classroom. The interview guide was reviewed by three experienced Mathematics teachers in high schools, after which it was piloted with four senior high school Mathematics teachers who were not included in the study to minimize difficulty and misunderstandings for the participants. This feedback was incorporated into the final draft used for data collection.

The interview questions were organized based on the participants' backgrounds and how teachers' beliefs about the purposes of assessment influenced assessment practices in the classroom. The first part of the instrument focuses on demographics such as age, teaching experience, academic qualification, and sex. The second part of the interview discusses teachers' beliefs about assessment purposes and how these beliefs influenced their practices. The interviews were audio-recorded and later transcribed verbatim by the first author.

Table 2. Mathematics teacher profile.

SN	Interviewee code	Educational Position	Academic qualification	Gender	Years of teaching experience	Subject taught
1	MT1	Deputy Head of Mathematics Department and Mathematics Teacher	Degree	Female	9	Core Mathematics and Elective Mathematics
4	MT4	Head of the Mathematics Department	Degree	Male	9	Core Mathematics
7	MT7	Deputy Head of Mathematics Department	Master's	Male	9	Core Mathematics and Elective Mathematics

SN	Interviewee code	Educational Position	Academic qualification	Gender	Years of teaching experience	Subject taught
8	MT8	Mathematics teacher	Master's	Male	4	Core Mathematics and Elective Mathematics
9	MT9	Mathematics teacher	Master's	Male	8	Core Mathematics and Elective Mathematics
10	MT10	Mathematics teacher	Degree	Female	9	Core Mathematics and Elective Mathematics
11	MT11	Mathematics teacher	Degree	Male	8	Core Mathematics and Elective Mathematics
12	MT12	Mathematics teacher	Degree	Male	4	Core Mathematics
13	MT13	Mathematics teacher	Master's	Female	4	Core Mathematics
14	MT14	Mathematics teacher	Degree	Male	10	Core Mathematics
15	MT15	Mathematics teacher	Master's	Male	17	Core Mathematics

3.4. Data Analysis

The quantitative data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS), version 27. The questionnaire was analyzed using mean and standard deviation. The mean and standard deviation were used to determine teachers' beliefs about assessment purposes, and the mean scores were ordered from the highest to the lowest. The standard deviation scores of the teachers' beliefs about assessment purposes were calculated for each item to determine how the teachers' beliefs are clustered around the mean scores (Pallant, 2020).

The qualitative data were analyzed by the first and second authors, who listened to each audio recording several times before transcribing them. All the audio recordings from the participants were in English and were transcribed verbatim by the first author. After transcription, the participants were sent the interview conversation to confirm whether their views were properly captured before the analysis was conducted. After recording, it was transcribed by the first author. All the authors read the document several times to understand the data and how it related to the aims of the study. Thematic analysis allows for the qualitative data to be analyzed, identified, and reported inductively into themes to support new conceptualizations (Braun & Clarke, 2019; Gioia, Corley, & Hamilton, 2012). Gioia et al. (2012) describe three phases of thematic analysis: first-order concepts, second-order concepts, and aggregate themes. The first and second authors compared the transcripts of each participant to establish common patterns, identifying similar statements and phrases related to teachers' beliefs about assessment purposes and practices. A coding frame was developed, consisting of all relevant phrases, using an open coding technique to extract statements into first-order concepts after conducting several iterative modifications and adjustments aligned with the research aims. These first-order concepts were then generalized across the interviews to represent teachers' beliefs about assessment purposes and practices. The coding frame was generated using a colour coding approach in Word for the process of coding. Subsequently, items or statements with similar characteristics from the first-order concepts were grouped into second-order categories, forming three themes to facilitate a detailed explanation of the findings (Braun & Clarke, 2019; Gioia et al., 2012). The second-order categories were aggregated into three themes: teachers' beliefs about the definition of assessment, the purposes of improving assessment practices, and the accountability purposes of assessment (see (Braun & Clarke, 2019; Gioia et al., 2012)).

4. RESULTS

Based on the results, the study identified three purposes of assessment: improving teaching and learning (improvement), evaluating schools and teachers for effectiveness (school accountability), and certifying student achievement (student accountability). However, the irrelevance purpose of assessment was rejected by the mathematics teachers (see Table 3 for details). Thus, the study findings indicated three beliefs about assessment purposes by Ghanaian mathematics teachers. These are the improvement purpose, school accountability, and students' accountability purposes of assessment (see Table 3 for details). The improvement purpose is where

assessment is used to support students' ongoing learning; the school accountability purpose is where assessment is used by school leaders to judge what teachers do (which might, for example, be used for promotional purposes); and the student accountability purpose is where assessment is used to assign grades and to prepare students for external examinations. The computation of the means of the measures yielded the following results: improvement purposes ($M = 4.25$, $SD = .76$), student accountability purposes ($M = 3.69$, $SD = 1.09$), school accountability purposes ($M = 3.40$, $SD = 1.28$), and irrelevant purposes ($M = 2.65$, $SD = 1.34$) (see Table 3 for details).

Table 3. Mean and standard deviation of teachers' assessment purposes.

Assessment conceptions subscales	Mean	SD
Improvement	4.25	0.76
School accountability	3.69	1.09
Student accountability	3.40	1.28
Irrelevant	2.65	1.34
Average scores	3.50	1.12

Note: $n = 308$, and the scale ranges are strongly disagree (1.0-1.8), disagree (1.81-2.60), undecided (2.61-3.40), agree (3.41-4.20), and strongly agree (4.21-5.00).

The research question two was to determine how teachers' beliefs about assessment purposes influenced their use of assessment practices. The study findings identified three thematic areas: teachers' definition of assessment, the improvement purposes of assessment, and the accountability purposes of assessment. These are discussed as follows:

4.1. Theme One: Teachers' Definition of Assessment

Several participants described assessment as a way to gather information on students' progress. For example,

Assessment is the process of gathering information on students' performance (Participant 12).

Assessment is the process whereby the teacher finds out students' understanding of a topic during the teaching and learning process. (Participant 8).

Assessment is the use of various methods to evaluate students' understanding of a topic (Participant 15).

Other participants expressed their views as follows:

The processes whereby teachers identify any difficulties encountered by students in learning to adopt teaching strategies (Participant 8 and Participant 10).

Assessment is used to determine what the students have learned, to identify their weaknesses, and it is a way of obtaining information about students' learning progress to inform teaching (Participant 5).

This implied that teachers' definition of assessment influenced how teachers used their assessment practices in the classroom. Teachers' gathering of information on students' performances is more of a judgment of students on the program. This aligns with the students' accountability purposes of assessment. On the other hand, assessment is a way to gather information by identifying students' weaknesses in the learning process to improve students' ongoing learning aligned with the improvement purposes of assessment (Schellekens et al., 2021). In summary, the definition of assessment by teachers determines how they use their practices in the classroom to improve and measure students' learning outcomes at the end of the program.

4.2. Theme Two: The Improvement Purposes of Assessment

The purpose of assessment improvement is to identify students' weaknesses in the learning process and address them accordingly. Some participants explained the purposes of assessment improvement as follows:

Formative assessment is used to assess student progress before, during, and after lessons. Thus, it involves collating students' results on the learning and evaluating them to identify their weaknesses and address them (Participant 15).

I assess before, during, and after lessons to determine students' level of understanding in the learning process. This is achieved through the use of questions. Questions are used at the beginning and during lessons to ascertain if students have understood what is being taught by the teachers (Participant 2).

Other participants reported the continuous nature of formative assessment as follows:

Formative assessment is used to gather information on students' learning progress to determine strengths and weaknesses during the teaching and learning process. This is a continuous and ongoing assessment practice of teachers to monitor students' progress on a day-to-day basis, thereby adjusting teaching and learning (Participant 15).

In addition, the purpose of assessment improvement is teachers' use of practices to support students' ongoing learning. This is where feedback is given on students' work in the classroom. For example, some participants narrated a story about the improvement purposes of assessment as follows:

[The improvement purposes of assessment] help to identify the progress of students in the teaching and learning process (Participant 5).

The improvement purposes of assessment are to enable teachers to know if students have mastered what has been taught in the classroom, where intervention is necessary (Participant 7).

The improvement purposes of assessment are aligned with formative assessment practices for students' learning, providing effective feedback for students (Wiliam & Leahy, 2016). Further study by Sadler (1989) showed that formative assessment practices improve students' competencies and remove inefficiencies in the learning process. This was shown in further interviews with the teachers that the improvement purposes of assessment aligns with the AfL, where teachers used their practices to guide students in learning Alonzo, Labad, Bejano, and Guerra (2021). Stobart (2008) believed that assessment for learning required an active involvement of learners in the learning process with the provision of feedback. This is where teachers modify learning with the provision of feedback to the students to improve their learning.

4.3. Theme Three: The Accountability Purposes of Assessment

The third theme, the accountability purposes of assessment, make teachers accountable to both schools and students. This aligned with Brown (2008) students and school accountability purposes of assessment. In Ghana, mathematics teachers' beliefs about the accountability purposes of assessment hold both teachers accountable to students and school authorities. The belief in school accountability is that schools are judged based on their performance in the senior high school external examination at the end of three years of education. For instance, participants indicated the meaning of summative assessment as follows:

Summative assessment is used to evaluate students' learning outcomes at the end of a teaching period (Participant 4).

Summative assessment is an evaluation used at the end of the term to measure students' performance in the program.

Thus, it is the judgment of students at the end of the term or academic year (Participant 8).

Summative assessment is the end-of-term examination conducted by teachers to make judgments about students' learning at the end of the term. Thus, the end-of-term examination conducted by teachers to make judgments about students' learning at the end of the year (Participant 2).

Some participants emphasised external examinations as a form of summative assessment to judge teachers and schools by parents and educational authorities. Some participants narrated as follows:

Teachers are judged by the pass rate of students in the external examinations conducted by the West African Examination Council and are questioned, both the teachers and the school administrators, if there is low performance of students in the external examination. This has promoted the rate of pressure on teachers teaching to the test and towards examination focus. Thus, there is the need for teachers to teach based on the curriculum content and not examination focus (Participant 11).

Parents and school authorities attach much attention to the WAEC examination, which affects teachers' assessment in the classroom. The parents and school authorities are not concerned with formative assessment but with a child's performance in the external assessment. Teachers are judged by the performance of students on the WASSCE. (Participant 15).

This aligned with Brown et al. (2011) study where school accountability purposes of assessment is a good way to evaluate schools, measure the quality of a school and to determine the performance of the students.

In addition, student accountability is used to judge students' performance in a program. Some participants expressed their views as follows:

Parents and school authority expectations are measured based on students' performance on the outcome of the WAEC examination results. Due to this, teaching is based on solving past questions from previous WAEC examinations, which makes assessment in the classroom not effectively used to check students' progress (Participant 4).

The high-stakes nature of the WAEC examination also affects the use of assessment practices. As a result, when I teach, I compare my questions to WAEC questions to determine how well the students are progressing. I do this by giving the students WAEC-standard questions (Participant 12).

This aligned with Brown et al. (2011) study, where student accountability purposes of assessment is to assign grade to students, a way to meet qualification on a set standard, the establishment of what students have learnt, and a way to measure students' thinking. In conclusion, the student and school accountability purposes of assessment are much emphasized by the Ghanaian Mathematics teachers due to students' performance in the external examination which is of importance to school authorities, students, and parents because of the promotion and placement purposes for students.

5. DISCUSSION

Teachers' beliefs about assessment purposes influence their assessment practices to support students' learning. However, senior high school Mathematics teachers' beliefs about assessment purposes in Africa are underexplored. The study gathered data from 308 Mathematics teachers' beliefs about the purposes of assessment and how their beliefs influenced their practices to support students' learning in the classroom in Ghana. Overall, the findings show that teachers view assessment from three thematic perspectives: school accountability purpose, student accountability purpose, and improvement purpose, which aligns with previous research work of Brown and Michaelides (2011), where teachers have three conceptions of assessment as accountability, improvement and irrelevance. Further, the study is contrary to Brown, Lake, and Matters (2011) where assessment served four purposes as to improve teaching and learning (improvement purpose); to evaluate schools and teachers for their effectiveness (school accountability purpose); to certify student achievement and make them accountable for outcomes (student accountability purpose); and a fourth purpose, where assessment is seen as irrelevant to the life and work of teachers and students (irrelevant purpose). This is in coherence with previous findings from Rosin et al. (2022) study, where assessment served four purposes of improvement, irrelevance, examination and teacher and student accountability.

Within Ghana, the present study results support the Osman et al. (2021) research on basic teachers' conceptions of assessment, where the teachers have three purposes of assessment, as mentioned above. Yidana and Anti (2018) study on secondary school economics teachers' conceptions of assessment in Ghana identified three purposes, with the irrelevance conception of assessment being rejected by these respondents. Participant data from the study indicated that the school and student accountability purposes overshadowing the improvement purposes. This inequality could partially explain why researchers (e.g., (Barnes et al., 2015)) have shown that there is a strong tension between using assessment for improved learning outcomes and for student accountability. Of additional relevance here is Crooks (2010) suggestion that, when the consequences associated with assessment are low, the assessment serves as an improvement of learning in the classroom; and conversely, where there is a high consequence associated with assessment, the assessment serves as a summative purpose for the judgment of students' learning.

Participant data in this study indicated that the teachers believed in both the formative and summative purposes of assessment. This finding aligns with those of previous scholars (Berry, 2008; Dixson & Worrell, 2016; McMillan, 2007) who all have argued that assessment serves both formative and summative purposes. However, the findings in this study suggest that the teachers in this study did not apply equal attention to each, as two of the three predominant

beliefs they demonstrated (accountability and assessment of learning) were consistent with summative practices. Furthermore, data indicate that the strongest and most common beliefs about the purpose of assessment were linked to improvement and accountability purposes. This finding supports previous findings from Vardar (2010) examination of sixth- to eighth-grade Turkish teachers' assessment conceptions, where student accountability was the most prevalent. The Vardar study attributed this to the Turkish high-stakes education culture, which puts students in a competition to obtain the higher exam grades required for university entrance. The Ghanaian education system is also characterized by high-stakes examinations, where teachers' performance is judged on their students' examination results. In this situation, teachers are rewarded and praised when students achieve good results in the external examinations but experience pressures from school authorities, parents, and school administrators when students perform poorly (Anane, 2015). This examination focus influenced their beliefs about the purposes of assessment and the selection of assessment strategies in the classroom (Barnes, Fives, & Dacey, 2017). This is why teachers in Ghana prefer assessment practices such as paper-and-pencil tests, class tests, and homework, which are aligned with the nature of the questions set in the external examination conducted by the WAEC. This situation aligns with previous research (Brown et al., 2011; Remesal, 2011) where cultural and educational policy of a country influences teachers' use of assessment practices in the classroom.

The differences in teachers' conceptions of assessment are explained as the tension that exists between teachers' formative and summative roles. Teachers believe that assessment should be used for improvement, but they operate in a testing and grading environment that requires them to produce grades for school authorities and other stakeholders in education. Researchers argue that the improvement purposes of assessment lead to the formative use of assessment, while the accountability conception leads to the summative use of assessment (Daniels & Poth, 2017; Takele & Melese, 2022). Further study revealed that primary school teachers conceptualize assessment as formative, while secondary school teachers conceptualize assessment as summative. This is because the primary school results are not used for selection and promotion into higher education, but it is the junior high school results that are used for the selection of students into senior high schools in Ghana (Anane, 2015; Dogbey & Dogbey, 2018). This is why the study of 493 foreign language teachers in the secondary school education context revealed that, although teachers predominantly conceptualized assessment as improving teaching and learning, the secondary school teachers were more favorable to the certification and accountability purposes of assessment, which are related to the summative purposes of assessment directly answerable to society for effective education.

In addition, the differences in conceptions of assessment are as a result of cultural, social, and policy contexts of the country (Fulmer, Lee, & Tan, 2015). This is why previous studies of Gebiril and Brown (2014) revealed that teachers' conceptions of assessment was influenced by the high-stakes and centralized education systems of these countries where examinations is used as a method to control schools, learners, and instructors and to admission to higher education. This situation is not different in Ghana, and this is why the National Council of Curriculum and Assessment (NaCCA) is advocating for teachers to focus more on assessment for learning, which is a way to promote students' learning. Thus, the activities undertaken by teachers and their learners provide information to be used as feedback to modify the teaching and learning with timely feedback to ensure that learners are assisted in the classroom. Further, the summative tension in the Ghanaian educational system, where external examinations are a yardstick for promotion and selection into tertiary institutions in the country, undermines the effective use of assessment for learning practices of teachers in the classroom (Ministry of Education, 2022).

However, the interview with the teachers revealed that teachers' beliefs about the purposes of assessment are influenced by the definition of assessment, the improvement purpose of assessment and the accountability purposes of assessment which aligned with the previous study of Taras (2005), where assessment is the judgement of students' work at the end of a program. The study concluded that how teachers define assessment is influenced by their beliefs about assessment purposes. This is similar to Yerdelen-Damar (2018) study of Turkish conceptions of teaching and

learning, where the constructivist conception was positively related to improvement, student accountability, and school accountability conceptions, whereas it was negatively related to irrelevant conceptions.

Finally, in Ghana, very little attention is often given to the assessment literacies of mathematics teachers during initial teacher training and professional development sessions. It has been observed that most teachers in Ghana have limited knowledge of how to use their assessments to support students' ongoing learning (Ministry of Education, 2018a). The study's findings indicated that when teachers' beliefs about assessment are developed through professional development courses, it enhances mathematics teachers' ability to identify what, why, and how to use their practices to support students' learning (Ministry of Education, 2018b). This is why there is a need to enhance in-service teachers' knowledge of assessment by creating an innovative assessment strategy during their training process.

This is important to improve the quality of teaching and learning at all levels, as it is highlighted in Ghana's Education Strategic Plan (2018-2023) as a key priority area for improving the educational system in Ghana. This is to ensure the highest quality of teaching through building a set of activities and events that communicate the influence and impact of teaching and learning, especially in the selection and use of appropriate teaching strategies and learning resources.

6. CONCLUSION AND RECOMMENDATION

While several studies Barnes et al. (2017) have been conducted in developed countries in this area, this study contributes to the literature by identifying teachers' beliefs about the purposes of assessment, such as student accountability, school accountability, irrelevant and improvement purposes in Ghana, specifically at the senior high school Mathematics level. Researchers Black and Wiliam (2009); Labad, Gonzalez-Rodriguez, Cobo, Punti, and Farre (2021), and Widiastuti, Mukminatien, Prayogo, and Irawati (2020) found that there are several factors that affect teachers' use of assessment practices. This study enhances teachers' understanding of beliefs regarding the purposes of assessment and how those beliefs influence their practices in the classroom.

Finally, the study recommended professional development for Mathematics teachers on their beliefs about assessment purposes and how these beliefs influence their assessment practices in the classroom. This is because a study by Widiastuti et al. (2020) on teacher professional development and practices of formative assessment showed that teachers with low Continuous Professional Development (CPD) involvement conduct poor formative assessment compared to teachers with high CPD. Teachers' CPD provides experiences and builds capabilities that positively impact their teaching and the implementation of assessment practices in the classroom. It is believed that teachers with high CPD participation will have greater teaching knowledge to enhance their beliefs and practices in the classroom (De Vries, Van Gasse, van Geel, Visscher, & Van Petegem, 2024). This is why the National Teachers' Standards Professional Practice ensures that teachers employ a repertoire of learning strategies in order to meet the learning needs of all children through the application of relevant resources. Again, the teachers should have professional knowledge to understand how children develop and learn in diverse contexts (cultural, socio-economic and educational backgrounds) and apply this in their teaching (Ghana Education Service, 2018).

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

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