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Relationship between Mathematics Teacher Educators' Conceptions of Assessment and their Implementation of Alternative Assessment Techniques

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Abstract: This study investigated the relationship between mathematics teacher educators' conceptions of assessment and their implementation of alternative assessment practices in Ghanaian Colleges of Education. An explanatory sequential mixed-methods design was adopted, involving 126 questionnaire respondents and eight interview participants. Quantitative data were analysed using descriptive statistics and one-way ANOVA, while qualitative data were analysed thematically. The findings showed that most teacher educators viewed assessment as a means of improving teaching and learning (56%). Overall implementation of alternative assessment practices was moderate (M = 2.94, SD = 1.17). Observation and oral presentation were the most frequently used techniques, whereas journal assessment was the least implemented. ANOVA revealed no significant differences across conception categories for most alternative assessment practices. However, significant differences were found in the implementation of project work and observation. Qualitative findings confirmed that teacher educators largely held formative conceptions of assessment but faced contextual challenges in implementing learner-centred assessment. The study concludes that assessment conceptions exert a limited but selective influence on practice. It recommends continuous professional development and institutional support to enhance the effective implementation of diverse alternative assessment techniques.

Keywords: Conceptions of assessment, alternative assessment, mathematics teacher educators, Colleges of Education, formative assessment, Ghana.

INTRODUCTION

Assessment is a fundamental aspect of education, serving as a means of evaluating student learning and guiding instructional practices (Asamoah-Gyimah, 2022). In educational contexts, assessment refers to the systematic process of gathering, analysing, and interpreting information about student learning to make informed decisions about teaching and learning (Poikela & Vuoskoski, 2016). It provides valuable insights into the effectiveness of instruction, identifies areas in which students may require additional support, and establishes accountability mechanisms that are critical for continuous improvement in education.

In recent decades, educational reforms have encouraged a shift from traditional assessment approaches towards more learner-centred and authentic forms of assessment. Conventional assessments, such as standardized examinations, quizzes, and multiple-choice tests, have long been valued for their efficiency, objectivity, and ease of administration. However, they have been criticized for placing greater emphasis on the recall of factual knowledge than on higher-order thinking, problem-solving, collaboration, and the application of knowledge in real-life contexts (Agaj, 2015). Consequently, alternative

assessment practices including performance-based assessment, portfolio assessment, authentic assessment, peer assessment, and self-assessment have gained increasing recognition as approaches that provide a more comprehensive evaluation of learners' competencies and promote reflective learning.

The successful implementation of alternative assessment depends largely on teachers because they make decisions regarding the selection, design, and use of assessment methods in their classrooms. Although educational policies may prescribe innovative assessment practices, teachers ultimately determine how these policies are translated into classroom practice.

Consequently, researchers have increasingly argued that teachers' classroom assessment practices are shaped not only by institutional policies and curriculum requirements but also by their personal beliefs, knowledge, experiences, and conceptions of assessment (Brown, 2004; Senyefia et al., 2020). Teacher conceptions of assessment refer to the beliefs and understandings educators hold regarding the purposes, functions, and value of assessment, and these beliefs influence how assessment is planned, implemented, and interpreted.

Evidence from research suggests that teachers who perceive assessment primarily as a tool for improving teaching and learning are more likely to employ formative and alternative assessment practices than those who regard assessment mainly as a mechanism for grading, accountability, or certification (David Carless & Susan M. Brookhart, 2024)). Conversely, educators with stronger examination-oriented beliefs often rely more heavily on conventional assessment methods. These findings indicate that teachers' conceptions of assessment play a critical role in shaping their classroom assessment decisions and may explain variations in assessment practices even within the same educational system.

In Ghana, reforms in teacher education have sought to transform assessment practices to align with competency-based education. The introduction of the Bachelor of Education (B.Ed.) curriculum in Colleges of Education places considerable emphasis on the use of alternative assessment approaches to develop reflective practitioners capable of facilitating meaningful learning experiences. The curriculum encourages mathematics teacher educators to employ a variety of assessment methods, including project work assessment, portfolio assessment, authentic assessment, peer assessment, and self-assessment among others, to evaluate preservice teachers' professional competencies rather than relying solely on written examinations (Boahin, 2018). These reforms reflect a broader shift towards learner-centred pedagogy and competency-based teacher preparation.

Despite these policy reforms, evidence suggests that the implementation of alternative assessment practices remains inconsistent across teacher education institutions. Factors such as limited resources, inadequate professional development, institutional expectations, workload, and assessment traditions continue to influence assessment practices. More importantly, differences in teacher educators' conceptions of assessment may contribute to variations in their willingness and ability to implement alternative assessment strategies. While some teacher educators embrace innovative assessment methods that promote active learning and reflection, others continue to favour conventional assessment approaches that they perceive as more objective, reliable, and manageable.

Previous studies have examined teachers' conceptions of assessment and classroom assessment practices in different educational contexts. However, relatively few studies

have specifically investigated whether mathematics teacher educators' conceptions of assessment are associated with their implementation of alternative assessment practices, particularly within Ghanaian Colleges of Education. Existing Ghanaian studies have largely focused on teachers in basic or secondary schools or on other subject areas, leaving limited empirical evidence regarding mathematics teacher educators who are responsible for preparing future mathematics teachers. Given the central role teacher educators play in shaping preservice teachers' assessment literacy and classroom practices, understanding this relationship is essential for strengthening teacher education and improving the quality of mathematics instruction.

This study therefore investigates the relationship between mathematics teacher educators' conceptions of assessment and their implementation of alternative assessment practices in Ghanaian Colleges of Education. By examining whether different assessment conceptions are associated with variations in the use of alternative assessment approaches, the study contributes to the growing body of literature on assessment in teacher education. The findings are expected to provide empirical evidence to support curriculum implementation, inform professional development initiatives, and guide policy interventions aimed at enhancing assessment practices in mathematics teacher education.

LITERATURE REVIEW

Teachers' conceptions of assessment refer to the beliefs, understandings, and values educators hold regarding the purposes and functions of assessment. Conceptions constitute a critical area of inquiry in educational research because they linked to how teachers interpret curricula, design instruction, and implement assessment practices. Brown (2004) conceptualized teachers' conceptions of assessment into four broad categories: assessment for improving teaching and learning, assessment for student accountability, assessment for school accountability, and assessment as irrelevant. These conceptions provide a theoretical framework for understanding why teachers differ in their assessment practices even when operating within the same educational system.

Teachers who perceive assessment primarily as a tool for improving learning are more likely to integrate formative and alternative assessment strategies into their teaching (Carless & Brookhart, 2024). Such educators emphasize continuous feedback, student reflection, and the development of higher-order thinking skills (Carless & Brookhart, 2024). Conversely, teachers whose conceptions are dominated by accountability and certification purposes often rely heavily on summative examinations because they regard these methods as more objective, standardized, and appropriate for measuring achievement (Brown & Harris, 2021).

Teacher conceptions reform through professional preparation, classroom experience, institutional expectations, and educational policies. Consequently, assessment practices are influenced not only by curriculum requirements but also by teachers' deeply held beliefs about the role of assessment in education.

Research has consistently demonstrated that these conceptions affect instructional decision-making, classroom interactions, and students' learning experiences (Carless & Brookhart, 2024).

Alternative Assessment Practices in Teacher Education

Alternative assessment refers to assessment approaches that require learners to demonstrate their knowledge, skills, and competencies through authentic and meaningful tasks rather than relying solely on traditional written examinations. Common forms include performance-based assessment, portfolio assessment, authentic assessment, peer assessment, self-assessment, reflective journals, presentations, projects, and case studies.

Within teacher education, alternative assessment has become increasingly important because it allows preservice teachers to demonstrate pedagogical competence, reflective practice, collaboration, and professional growth (Transforming Teacher Education and Learning, 2018). Competency-based teacher education programmes advocate multiple assessment methods to evaluate knowledge application rather than factual recall. These approaches provide richer evidence of professional competence and better align assessment with contemporary educational goals (Transforming Teacher Education and Learning, 2018).

The Bachelor of Education curriculum implemented in Ghana's Colleges of Education encourages teacher educators to employ diverse assessment approaches that support competency development (Transforming Teacher Education and Learning, 2018). Performance tasks, classroom demonstrations, reflective portfolios, peer assessment, and authentic learning activities are recommended as integral components of teacher preparation. Nevertheless, empirical evidence indicates that written examinations continue to dominate assessment practices in many teacher education institutions despite these policy expectations (Baidoo-Anu & DeLuca, 2023).

Teacher Conceptions and Assessment Practices

The relationship between teachers' conceptions of assessment and their classroom assessment practices has received increasing attention in educational research. Theoretical perspectives suggest that teachers' beliefs influence instructional choices, including the selection of assessment methods (Brown, 2004). Teachers who conceptualize assessment as an instrument for learning generally employ formative feedback, authentic assessment, collaborative learning activities, and student self-evaluation. In contrast, teachers whose beliefs emphasize certification and accountability frequently adopt conventional testing approaches.

Brown (2004) argued that teachers' assessment decisions are grounded in their personal conceptions of assessment. Similarly, Brown and Harris (2014) observed that teachers' beliefs substantially influence the implementation of classroom assessment practices, although contextual factors such as policy requirements and institutional culture may moderate this relationship.

Research across different countries has generally reported positive associations between learning-oriented assessment conceptions and the implementation of formative or alternative assessment strategies. However, the strength of this relationship varies across educational systems due to differences in curriculum reforms, accountability policies, teacher autonomy, and available resources (Brown, 2024; Halimah et al., 2024; Meijer et al., 2023). Some studies have also found inconsistencies between teachers stated beliefs

and their classroom practices, suggesting that external constraints may limit teachers' ability to implement assessment approaches consistent with their conceptions.

METHODOLOGY

Research Design

To provide a comprehensive understanding of how mathematics college teachers' conceptions of assessment is linked to their implementation of alternative assessment techniques the study employed an explanatory sequential design. When a researcher seeks to first establish general patterns or trends and then explore his findings in greater depth through qualitative inquiry, an explanatory sequential design is the best design to use. In this design, quantitative data were collected and analysed in the first phase. It was then followed by qualitative data collection and analysis. The purpose of the second phase was to improve, confirm, complement, and corroborate the quantitative results (Creswell, 2014). This type of design or approach is particularly well-suited to studies with the objective to move from expansive numerical patterns to rich, contextual explanations, combining the strengths of both quantitative and qualitative methods.

Sample and Sampling Techniques

This study adopts a multistage sampling approach to ensure a representative and systematic selection of participants for both quantitative and qualitative components. For the quantitative phase, a census sampling method was employed to select all 184 mathematics teacher educators in the 46 public colleges of education. Meanwhile data was analysed using 126 responded to the instrument. For the qualitative phase, 8 participants were purposively selected from the survey respondents to obtain diverse perspectives based on their assessment conceptions and implementation experiences. This facilitated an in-depth exploration of the quantitative findings.

Data Collection Instruments

Quantitative data were collected using a structured questionnaire comprising two sections relevant to these objectives. The first section measured mathematics teacher educators' conceptions of assessment using statements adapted from established assessment conception frameworks. The second section measured the extent to which respondents implemented alternative assessment practices, including performance-based assessment, portfolio assessment, authentic assessment, peer assessment, and self-assessment. Responses were measured using a five-point Likert scale. The last part looked at the relationship between the teachers' conceptions of assessment and their implementation of alternative assessment practices.

Qualitative data were obtained through semi-structured interviews. The interview protocol explored participants' beliefs about assessment, factors influencing their assessment choices, and explanations for their use or non-use of alternative assessment practices.

Data Analysis

Descriptive statistics were computed to summarize participants' assessment conceptions and implementation of alternative assessment practices. To determine whether implementation differed according to assessment conception categories, one-way analysis of variance (ANOVA) was performed. Where statistically significant differences were identified, Tukey's Honestly Significant Difference (HSD) post hoc test was conducted to determine the specific groups responsible for the differences. Statistical significance was determined at the 0.05 level.

Qualitative interview data were analysed using thematic analysis. Interview transcripts were read repeatedly to achieve familiarity with the data before initial codes were generated. Similar codes were grouped into broader themes that explained how mathematics teacher educators' conceptions influenced their implementation of alternative assessment practices. Finally, quantitative and qualitative findings were integrated during interpretation to provide a comprehensive explanation of the relationship between assessment conceptions and classroom assessment practices.

RESULTS AND DISCUSSION

In this paper, relationship between mathematics teacher educators' conceptions of assessment and their implementation of alternative assessment techniques, the first part sought to find out mathematics teacher educators' conception of assessment. Mathematics teacher educators' conception was measured by the respondents' ratings of their level of agreement or disagreement with selected indicators from Teacher Conceptions of Assessment (TCoA) questionnaire items developed by Brown (2006). The adapted instrument focused on three thematic areas namely assessment for improving teaching and learning, assessment for making teachers and school accountable for student learning, and Assessment for making students accountable for learning. Participants responses to the items were analysed using means, and standard deviation and presented in Table 1

Table 1: Mathematics Teacher Educators' Conceptions of Assessment

Assessment Conception	N (%)	Mean	Sd
Improving Teaching and Learning	71(56)	4.1031	0.92983
Teacher/ School Accountability	21 (17)	2.6454	1.94289
Student Accountability	34(27)	3.0185	1.73537

The findings Form Table 1 revealed that mathematics teacher educators predominantly conceived assessment as a means of improving teaching and learning. This conception recorded the highest mean score (M = 4.10, SD = 0.93), indicating a strong consensus among respondents that assessment should primarily be used to monitor students' understanding, provide feedback, and enhance instructional practices. The qualitative findings reinforced this result, with participants describing assessment as an integral component of the teaching-learning process. For example, one participant explained, "I assess students to evaluate their understanding and ensure they are meeting learning objectives" (Participant H), while another indicated that assessment is used "to support

continuous learning and give feedback" (Participant D). These responses suggest that mathematics teacher educators largely embrace a formative conception of assessment.

Assessment as a tool for student accountability emerged as the second most prominent conception (M = 3.02, SD = 1.74). Although respondents moderately endorsed this view, interview participants acknowledged that assessment encourages learners to take responsibility for their academic work. As Participant B noted, "Assessment reminds learners that the outcome depends on their own effort," while Participant D observed that "My students take their work more seriously when they know it will be assessed." These findings indicate that teacher educators recognise assessment as a motivational tool that promotes students' responsibility and commitment to learning.

In contrast, teacher/school accountability was the least endorsed conception (M = 2.65, SD = 1.94). Nevertheless, qualitative evidence suggests that some teacher educators perceive assessment as an important mechanism for evaluating instructional effectiveness and informing professional reflection. For instance, Participant A stated, "Assessment results show whether I am teaching effectively. If learners are not performing well, I am forced to reflect and change how I teach so they can perform better in my next assessment." Another participant highlighted the influence of curriculum requirements on assessment practices, noting that "the curriculum determines the types and frequency of assessments" (Participant D).

Overall, the quantitative and qualitative findings converged to show that mathematics teacher educators primarily conceptualise assessment as a formative process that supports teaching and learning, while assigning comparatively less importance to its accountability functions. The interview data further illuminate the survey results by demonstrating that teacher educators value assessment chiefly for its role in enhancing students' learning and informing instructional improvement rather than for judging teacher or school performance.

To find out the extent of implementation of alternative assessment by the mathematics teacher educators, they were asked to indicate how frequent they use the various alternative assessment techniques in a semester. Table 2 presents the results of the findings.

Table 2: Teachers' rating of their frequency of enactment of alternative assessment techniques in a semester

	None of the lessons	One or Two of the lessons	Quarter of the lessons	Half of the lessons	Almost All the lessons	Mean	Std. Dev
	N (%)	N (%)	N (%)	N (%)	N (%)		
Oral Presentation	6(5)	27(21)	30(24)	36(29)	27(21)	3.40	1.181
Project Work	14(11)	51(41)	24(19)	29(23)	8(6)	2.73	1.127
Self-Assessment	27(21)	35(28)	12(9)	26(21)	26(21)	2.91	1.475
Peer Assessment	24(19)	37(29)	13(10)	41(32)	11(9)	2.83	1.309
Portfolio Assessment	24(19)	52(41)	15(12)	29(23)	6(5)	2.53	1.178

Journal Assessment	38(30)	51(40)	19(15)	16(13)	2(2)	2.15	1.044
Observation	2(2)	4(3)	23(18)	57(45)	40(32)	4.02	0.881
Mean enactment				.		2.94	1.170

Findings from the Table 2 show that, in all, the mean enactment score (M = 2.94, SD = 1.17) indicates a **moderate level of implementation** of alternative assessment practices.

Among the techniques examined, **observation** was the most frequently employed (M = 4.02, SD = 0.88), with 77% of the respondents reporting that they used it in at least half or almost all of their lessons. This finding suggests that observation is the preferred alternative assessment technique, likely because it enables teacher educators to monitor students' participation, engagement, and learning progress continuously during classroom instruction.

Oral presentation was the second most frequently enacted technique (M = 3.40, SD = 1.18). Half of the respondents (50%) reported using oral presentations in at least half of their lessons, indicating that teacher educators value opportunities for students to demonstrate their understanding through verbal communication and explanation.

In contrast, **project work** (M = 2.73, SD = 1.13), **self-assessment** (M = 2.91, SD = 1.48**), peer assessment** (M = 2.83, SD = 1.31), and **portfolio assessment** (M = 2.53, SD = 1.18) were implemented only occasionally. The relatively lower mean scores and greater variability suggest that these learner-centred assessment approaches are not consistently integrated into instructional practice across respondents.

Journal assessment was the least frequently enacted technique (M = 2.15, SD = 1.04). Approximately 70% of the respondents indicated that they used journal assessment in none or only one or two lessons during the semester, implying that reflective writing activities are rarely incorporated into mathematics assessment.

In all, the findings indicate that while mathematics teacher educators make use of some alternative assessment techniques, their implementation is selective. Classroom observation and oral presentations are the most frequently employed approaches, whereas more student-centred techniques such as project work, self-assessment, peer assessment, portfolio assessment, and journal assessment are used less consistently. This pattern suggests that although alternative assessment has gained some acceptance, its implementation remains uneven across assessment techniques.

To show whether there is a relationship between mathematics teacher educators' conceptions and their implementation of alternative assessment a one-way Analyses of Variance (ANOVA) was conducted. Table 3 shows the results of the analyses.

Table 3: Results of the one-way ANOVA test of the differences in the teachers' mean ratings of implementation of alternative assessment techniques by their conceptions of assessment

	Conception Categories	N	Mean	SD		Sum of Squares	Df	Mean Square	F	Sig.
Oral Presentation	Improving quality teaching/learning	71	3.48	1.132	Between Groups	0.885	2	0.432	0.304	.738

	Making students accountable	34	3.29	1.292	Within Groups	173.327	123	1.421		
	Making teachers/school accountable	21	3.35	1.226	Total	174.192	125			
	Total	126	3.41	1.185						
Project Work	Improving quality teaching/learning	71	2.96	1.270	Between Groups	8.352	2	4.176	3.455	0.035
	Making students accountable	34	2.56	0.894	Within Groups	147.456	123	1.209		
	Making teachers/school accountable	21	2.30	0.657	Total	155.808	125			
	Total	126	2.74	1.121						
Self-Assessment	Improving quality teaching/learning	71	3.07	1.495	Between Groups	9.265	2	4.632	2.161	0.120
	Making students accountable	34	2.91	1.485	Within Groups	261.5583	123	2.144		
	Making teachers/school accountable	21	2.30	1.302	Total	270.848	125			
	Total	126	2.90	1.478						
Peer Assessment	Improving quality teaching/learning	71	2.97	1.309	Between Groups	6.037	2	3.019	1.775	0.174
	Making students accountable	34	2.82	1.359	Within Groups	207.435	123	1.700		
	Making teachers/school accountable	21	2.35	1.182	Total	213.472	125			
	Total	126	2.83	1.312						
Portfolio Assessment	Improving quality teaching/learning	71	2.72	1.173	Between Groups	7.221	2	3.611	2.689	0.072
	Making students accountable	34	2.47	1.212	Within Groups	163.787	123	1.343		
	Making teachers/school accountable	21	2.05	0.999	Total	171.008	125			
	Total	126	2.54	1.174						
Journal Assessment	Improving quality teaching/learning	71	2.20	1.129	Between Groups	0.393	2	0.197	0.177	0.838
	Making students accountable	34	2.12	0.977	Within Groups	136.719	123	1.112		
	Making teachers/school accountable	21	2.05	0.887	Total	136.112	125			
	Total	126	2.15	1.048						
Observation	Improving quality teaching/learning	71	3.92	0.937	Between Groups	5.510	2	2.755	3.716	0.027
	Making students accountable	34	4.35	0.597	Within Groups	90.458	123	0.741		
	Making teachers/school accountable	21	3.80	0.951	Total	95.968	125			
	Total	126	4.02	0.880						

The findings from Table 3 showed that teachers' conceptions of assessment did not significantly influence the implementation of oral presentation, $F(2, 123) = 0.304$, $p = .738$; self-assessment, $F(2, 123) = 2.161$, $p = .120$; peer assessment, $F(2, 123) = 1.775$, $p = .174$; portfolio assessment, $F(2, 123) = 2.689$, $p = .072$; and journal assessment, $F(2, 123) = 0.177$, $p = .838$. These findings suggest that mathematics teacher educators implemented these

assessment techniques at similar levels irrespective of whether they primarily conceived assessment as improving teaching and learning, promoting student accountability, or ensuring teacher/school accountability.

However, statistically significant differences were observed for project work, $F(2, 123) = 3.455$, $p = .035$, and observation, $F(2, 123) = 3.716$, $p = .027$. Teachers who viewed assessment primarily as a means of improving teaching and learning reported the highest implementation of project work (M = 2.96, SD = 1.27), followed by those who viewed assessment as promoting student accountability (M = 2.56, SD = 0.89), whereas those who emphasised teacher/school accountability reported the lowest implementation (M = 2.30, SD = 0.66). In contrast, the implementation of observation was highest among teachers who conceived assessment as promoting student accountability (M = 4.35, SD = 0.60), compared with those who emphasised improving teaching and learning (M = 3.92, SD = 0.94) and teacher/school accountability (M = 3.80, SD = 0.95).

Overall, the findings indicate that teachers' conceptions of assessment have a limited but selective influence on the implementation of alternative assessment techniques. While conceptions do not appear to affect the use of most techniques, they are associated with significant differences in the implementation of project work and classroom observation. This suggests that teachers' underlying beliefs about the purpose of assessment shape the adoption of certain alternative assessment practices rather than influencing their assessment practices broadly.

DISCUSSION

This study examined whether there is a relationship between mathematics teacher educators' conceptions of assessment and their implementation of alternative assessment techniques. The findings revealed that teacher educators predominantly conceived assessment as a means of improving teaching and learning, with comparatively less emphasis on student accountability and teacher/school accountability. This finding aligns with the growing recognition that assessment should primarily serve formative purposes by supporting learning, informing instruction, and providing meaningful feedback rather than merely evaluating performance (DeLuca et al., 2021; Brown, 2021)). The interview data further reinforced this perspective, as participants consistently described assessment as a tool for monitoring students' understanding, identifying learning needs, and improving instructional practices.

Despite the strong endorsement of assessment for improving teaching and learning, the implementation of alternative assessment techniques was only moderate. Observation and oral presentations were the most frequently enacted techniques, whereas project work, self-assessment, peer assessment, portfolio assessment, and journal assessment were used less consistently. This suggests that although teacher educators appreciate the formative value of assessment, translating these beliefs into classroom practice remains challenging. This finding is consistent with many studies that highlight similar trends of partial adoption. For instance, DeLuca et al. (2021) noted that while alternative and formative assessments are widely supported in teacher education programmes, their actual implementation is inconsistent, often hindered by limited professional development and contextual challenges. Similarly, Yan, et al., (2023) conducted a systematic review of teachers' assessment literacy and found that while teachers often understand the concepts behind

alternative assessments, they struggle to apply this knowledge consistently in their classrooms.

The comparatively lower use of learner-centred assessment techniques may reflect contextual constraints such as limited instructional time, large class sizes, heavy workloads, and insufficient institutional support, all of which have been identified in previous assessment research (Yan et al., 2021; Carless & Brookhart, 2024; Asamoah, et al, 2024).

The ANOVA results further showed that teachers' conceptions of assessment did not significantly influence the implementation of oral presentations, self-assessment, peer assessment, portfolio assessment, or journal assessment. These findings imply that regardless of whether teacher educators viewed assessment as improving teaching and learning or promoting accountability, they implemented these assessment techniques at similar levels. This suggests that assessment practices may be shaped more by other factors than by teachers' assessment beliefs alone. However, significant differences were found in the implementation of project work and classroom observation. Teacher educators who viewed assessment as a means of improving teaching and learning reported greater use of project work than those who primarily associated assessment with accountability. This finding is understandable because project work promotes inquiry, problem-solving, collaboration, and the application of knowledge, all of which are consistent with formative assessment principles. Conversely, classroom observation was most frequently implemented by teacher educators who viewed assessment as promoting student accountability, suggesting that observation may also be used to monitor students' participation, engagement, and responsibility for learning.

In all, the findings indicate that mathematics teacher educators' conceptions of assessment exert a limited but selective influence on their implementation of alternative assessment techniques. While beliefs about assessment appear to encourage the use of some learner-centred approaches, they are insufficient on their own to explain assessment practice. The findings therefore suggest that improving the implementation of alternative assessment requires not only fostering positive conceptions of assessment but also addressing contextual barriers through professional development, institutional support, and policies that encourage the routine use of authentic assessment practices in mathematics teacher education.

CONCLUSION

This study found that mathematics teacher educators predominantly conceive assessment as a tool for improving teaching and learning, while student accountability and teacher/school accountability are less strongly endorsed. Although alternative assessment practices were implemented at a moderate level, observation and oral presentations were used more frequently than project work, self-assessment, peer assessment, portfolio assessment, and journal assessment. Furthermore, teachers' conceptions of assessment had a limited but selective influence on the implementation of alternative assessment techniques, with significant differences observed only for project work and observation. These findings suggest that while positive conceptions of assessment are important, enhancing the implementation of alternative assessment practices in Colleges of Education requires supportive institutional conditions and continuous professional development for mathematics teacher educators.

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