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The Contribution of Competency-Based and Multi-Dimensional Assessment on Learners' Holistic Development in West Hararghe Secondary Schools, Ethiopia

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Abstract

Competency-based and multi-dimensional assessment is increasingly promoted to foster holistic learner development, yet evidence from low-resource African settings remains limited. This explanatory sequential mixed-methods study examined assessment practices, their association with learners' cognitive, social and emotional competencies, and contextual barriers to implementation in secondary schools of West Hararghe Zone, Ethiopia. Quantitative data were collected from 300 students in eight schools using a validated questionnaire (CFI = .94, RMSEA = .06, Cronbach's α = .82–.91) and analyzed using multiple regression, structural equation modeling and bootstrapped mediation analysis. Qualitative data came from interviews with 60 teachers and document analysis of national and regional assessment guidelines. Formative assessment was the most common approach (64%), whereas peer assessment (32%), self-assessment (27%) and competency-aligned rubrics (25%) were used less often. Assessment practices significantly predicted holistic learner competence ($R^2 = .43$, $p < .001$) and were most strongly related to cognitive competence (β = .52). Learner engagement (indirect effect = .21) and emotional competence (indirect effect = .12 on academic performance) partially mediated these relationships. Interviews and document analysis identified barriers including limited teacher preparation, heavy teacher workloads, resource shortages, examination-oriented accountability and inconsistent school-level support. Sustainable implementation requires targeted professional development, adequate resources, stronger school-level support and alignment of classroom assessment with high-stakes examinations.

Introduction

Educational assessment serves a dual function: it not only measures learning outcomes but fundamentally shapes the learning process itself [1, 2]. Within contemporary educational discourse, assessment has evolved beyond a mere measurement tool to become a strategic mechanism for cultivating well-rounded learners [3, 4]. The limitations of conventional assessment paradigms, which typically privilege factual recall and end-of-term examinations, have been extensively documented for their failure to adequately address the full spectrum of student development, including higher-order thinking, collaborative skills, and emotional regulation [5, 6]. To address these shortcomings, educational systems worldwide are adopting competency-based and multi-faceted assessment frameworks that prioritize real-world application, skill acquisition, and the nurturing of positive attitudes and values within authentic learning environments [7, 8].

Global and regional context of assessment reform

Internationally, the shift toward competency-based assessment has been driven by recognition that traditional examinations inadequately prepare students for the complexities of modern life and work [9]. Countries such as Finland, Singapore, Canada, and New Zealand have pioneered assessment systems that integrate formative feedback, self-assessment, peer evaluation, and authentic performance tasks to measure a broader range of competencies [3]. In Sub-Saharan Africa, similar reforms have gained momentum, with countries like Kenya, Rwanda, and South Africa adopting competency-based curricula

and assessment frameworks [10, 11]. Recent studies have documented both the potential and challenges of implementing competency-based approaches in African contexts, highlighting the importance of teacher preparation, resource availability, and alignment with examination systems [12, 13]. However, implementation challenges persist across the region, including inadequate teacher preparation, resource constraints, and misalignment between classroom assessment and high-stakes examinations [12, 13].

The Ethiopian context

Ethiopia's education sector has witnessed substantial policy reforms in recent years, with the Ministry of Education introducing competency-based curricula and learner-centered pedagogical frameworks to enhance educational quality and relevance [14, 15]. The New Education and Training Policy [15] explicitly emphasizes the development of critical thinking, problem-solving, creativity, and socio-emotional competencies as central goals of basic education. Similarly, the Education Sector Development Programme VI (ESDP VI) [16] and the Education and Development Roadmap articulate a vision for assessment systems that support holistic learner development rather than mere certification.

Despite these policy commitments, research suggests that classroom assessment in Ethiopia remains heavily examination-driven, with insufficient integration of formative feedback, self-evaluation, peer collaboration, and practices that nurture socio-emotional capacities [17, 18]. The 2024 National Assessment Capacity Building Report [19] documented persistent gaps between policy aspirations and classroom realities, highlighting limited teacher assessment literacy, inadequate instructional resources, and systemic pressures to prioritize examination preparation over holistic development. This implementation gap raises critical questions about whether current evaluation systems are adequately equipped to foster comprehensive student development.

The West Hararghe context

The West Hararghe Zone exemplifies these implementation challenges, where limited teacher professional development, insufficient instructional resources, and fragmented institutional support systems impede effective deployment of competency-based and multi-dimensional assessment practices [20]. The zone is characterized by large class sizes (averaging 55–65 students), limited access to teaching and learning materials, and a predominantly rural population with limited educational infrastructure. These conditions, while not unique to West Hararghe, create particular challenges for implementing assessment approaches that require individualized feedback, portfolio documentation, and performance-based evaluation.

While educational policy and scholarly literature increasingly advocate for these innovative assessment approaches, empirical research documenting their actual implementation and impact within this Ethiopian context remains scarce. The few available studies have focused primarily on policy analysis or teacher perceptions, with limited attention to student outcomes or the mechanisms through which

assessment practices influence learning [10, 18]. Consequently, systematic investigation of current assessment practices and their relationship to students' cognitive, social, and emotional outcomes is both timely and necessary.

Research gap and contribution

This study addresses three critical gaps in the existing literature. First, while international research has established the benefits of competency-based and multi-dimensional assessment [1, 21], few studies have examined these approaches in low-resource African contexts where implementation challenges are most acute. Second, existing research has rarely investigated the mediating mechanisms such as learner engagement and emotional competence through which assessment practices influence holistic development [22]. Third, the study responds to calls for mixed-methods research that integrates quantitative evidence of assessment effects with qualitative understanding of contextual barriers and enablers [23].

The novelty of this study lies in its comprehensive examination of both the types of assessment practices currently employed in West Hararghe secondary schools and their relationships with multiple dimensions of learner development. By employing a mixed-methods design, the study provides both generalizable evidence of assessment effects and contextually grounded insights into implementation challenges, offering a model for similar investigations in comparable educational settings.

Research questions

Guided by the conceptual framework presented in Fig. 1, the study addresses three research questions:

1. What types of competency-based and multi-dimensional assessment approaches are currently utilized in secondary schools of West Hararghe Zone?
2. To what extent do competency-based and multi-dimensional assessment approaches predict learners' cognitive, social, and emotional competencies?
3. What contextual barriers affect the implementation of competency-based and multi-dimensional assessment approaches?

Conceptual and theoretical framework

Theoretical foundations

This study is grounded in three interconnected theoretical perspectives that inform the understanding of assessment practices and their relationship to holistic learner development.

Constructivist Learning Theory [24, 25] positions learning as an active, socially situated, and context-dependent process of knowledge construction. From this perspective, assessment should not merely

measure what students have learned but should be integrated into the learning process itself, providing opportunities for reflection, collaboration, and application of knowledge in authentic contexts [2]. Constructivism supports multi-dimensional assessment approaches that capture the complexity of learning across cognitive, social, and affective domains.

Self-Determination Theory [26, 27] provides insight into the motivational mechanisms through which assessment practices influence learning outcomes. According to this theory, learners are intrinsically motivated when their needs for autonomy, competence, and relatedness are satisfied. Assessment practices that provide meaningful feedback, offer choices, and recognize individual progress support these needs, thereby enhancing engagement and deeper learning. Conversely, assessment approaches that emphasize competition, comparison, and external rewards may undermine intrinsic motivation and lead to surface-level learning [1].

Control-Value Theory of Achievement Emotions [28, 29] explains how assessment experiences shape learners' emotional states and subsequent academic performance. According to this theory, emotions such as enjoyment, hope, and pride arise when learners feel in control of their learning and value the outcomes. Assessment practices that are perceived as fair, supportive, and focused on learning rather than judgment foster positive emotions that enhance cognitive processing and academic achievement [30]. Conversely, assessment practices that emphasize high-stakes evaluation and social comparison may generate anxiety, hopelessness, and shame, which impair performance and undermine well-being.

Conceptual framework

The conceptual framework of this study posits that assessment practices categorized as cognitive-oriented, social-oriented, and emotional-oriented have direct relationships with corresponding learner competencies. Furthermore, learner engagement and emotional competence are hypothesized to function as mediating variables in the pathway connecting assessment practices to holistic learner development and academic achievement outcomes.

The framework is summarized in Fig. 1.

Definitions of key constructs

Multi-dimensional assessment denotes a holistic evaluation framework that systematically documents student growth across cognitive, social, affective, and behavioral dimensions [5, 31]. This approach employs varied assessment modalities, including authentic performance tasks, project-based evaluations, portfolio documentation, collaborative peer review, self-reflective exercises, and learning journals [3, 32].

Competency-based assessment focuses on students' demonstrated capacity to deploy well-defined competencies such as analytical reasoning, creative problem-solving, effective communication, and

teamwork in authentic performance contexts [8, 33]. Competencies represent integrated constellations of knowledge, practical skills, attitudinal dispositions, and ethical values that enable successful functioning across varied real-world situations [7, 9]. Evidence from implementation studies indicates that competency-based assessment enhances learner self-direction and intrinsic motivation by foregrounding mastery achievement rather than competitive norm-referenced ranking [34, 35].

Cognitive-oriented assessment refers to assessment practices designed to elicit and evaluate students' cognitive skills, including questioning, quizzes, problem-solving tasks, and performance-based evaluations that require higher-order thinking. These practices are distinguished from the cognitive competencies they are intended to assess, which represent students' actual cognitive abilities, knowledge, and reasoning skills [1, 31].

Holistic learner competence in this study is conceptualized as an integrated multidimensional construct encompassing cognitive competence (knowledge application, critical thinking, problem-solving), social competence (communication, collaboration, relationship management), and emotional competence (emotional awareness, regulation, and expression). The overall holistic competence score was derived through a second-order factor model in confirmatory factor analysis, where cognitive, social, and emotional competencies loaded onto a higher-order holistic competence factor. This approach is theoretically grounded in the literature on holistic development [3, 30] and empirically supported by the acceptable fit of the second-order model ($\chi^2/df = 2.67$, CFI = .93, RMSEA = .07, SRMR = .06).

Empirical evidence on assessment and holistic development

Scholarly evidence consistently affirms the interconnectedness of cognitive, social, and affective developmental pathways. Students' intellectual engagement and academic outcomes are significantly shaped by their emotional states and the quality of their peer and teacher relationships [30, 36]. Accumulated research demonstrates that formative, student-centered assessment approaches exert positive effects on academic achievement, interpersonal skills, and affective involvement in learning [1, 21, 37].

Research specifically examining competency-based assessment has shown positive effects on learner motivation, self-regulation, and skill development across diverse contexts [33, 35]. Studies in Sub-Saharan Africa have documented both the potential and challenges of implementing competency-based approaches, highlighting the importance of teacher preparation, resource availability, and alignment with examination systems [10, 11]. Recent investigations in East African contexts have emphasized the need for assessment reforms that address systemic barriers while building teacher capacity for implementing competency-based approaches [10].

However, resource-constrained educational environments face considerable obstacles in implementing these approaches, including overcrowded classrooms, inadequate instructional materials, excessive

teacher workloads, and limited opportunities for professional growth [12, 13, 38]. The current investigation directly addresses this empirical void by generating contextually grounded evidence from secondary education settings in West Hararghe Zone.

Methods

Research design

The study adopted an explanatory sequential mixed-methods design [23], in which quantitative data collection and analysis were conducted first, followed by a qualitative phase to explain and contextualize quantitative findings. This design was selected because it allows for both generalizable evidence of assessment effects (quantitative) and in-depth understanding of implementation processes and contextual barriers (qualitative). The qualitative phase was designed to explain and elaborate upon the quantitative results, particularly the mechanisms through which assessment practices influence learner outcomes and the contextual factors that facilitate or impede implementation.

The study design and sampling procedure are summarized in Fig. 2.

Participants and sampling

Quantitative component

The target population comprised secondary school students (Grades 9–12) in West Hararghe Zone, Oromia Regional State, Ethiopia. According to the Oromia Education Bureau [20], there are approximately 12 secondary schools in the zone with a total student population of approximately 2,500. Sample size was determined using Cochran's formula ($n_0 = Z^2pq/e^2$) with a 95% confidence level (Z = 1.96), 5% margin of error (e = .05), and an estimated population proportion of 0.5, yielding an initial estimate of 384 ($n_0 = 1.96^2 \times .5 \times .5 / .05^2$). Applying the finite-population correction for N ≈ 2,500 [$n = n_0 / (1 + (n_0 - 1)/N)$] gave a minimum of approximately 333. Cochran's formula was selected because it provides a statistically rigorous approach for determining sample size when the population proportion is unknown or assumed to be 0.5 (maximum variability), and it is widely used in educational research for its conservatism and applicability to finite populations [39]. The achieved sample of 300 is slightly below this minimum and corresponds to a margin of error of approximately 5.3% at the 95% confidence level, which was considered acceptable for the purposes of this study (see Limitations). The sample size of 300 was deemed adequate for SEM based on the recommendation of at least 10 observations per estimated parameter [40]. The hypothesized SEM model included approximately 25 freely estimated parameters (including factor loadings, path coefficients, and error variances), requiring a minimum of 250 cases, which the achieved sample of 300 exceeded.

Stratified random sampling ensured proportional representation across grade levels (9–12), gender, and school location (urban, peri-urban, rural). The 300 students were drawn from 8 secondary schools (out of

12 in the zone) that were randomly selected to represent the diversity of school contexts in the zone. The response rate was 85% for students.

Qualitative component

60 secondary school teachers were selected through purposive sampling based on years of teaching experience (range 2–22 years), subject specialization (mathematics, sciences, language, social studies), and direct involvement in classroom assessment practices. Teachers were drawn from the same 8 secondary schools that participated in the quantitative phase, ensuring alignment between the two phases and facilitating integration of findings. The rationale for selecting 8 schools was based on achieving diversity in school characteristics (urban, peri-urban, rural; large vs. small enrollment; high vs. low resource availability) while maintaining feasibility for in-depth qualitative inquiry. The remaining 4 schools were excluded due to accessibility constraints (seasonal road closures during the rainy season and security concerns in remote areas). These excluded schools were located in the most remote rural areas of the zone, characterized by smaller enrollments (averaging 180 students) and greater resource limitations compared to included schools. The exclusion of these schools may introduce selection bias, as the most remote and resource-constrained schools were not represented; this limitation is acknowledged in the Limitations section. The response rate was 78% for teachers.

Document analysis

Assessment guidelines, curriculum frameworks, and evaluation manuals from the Ministry of Education and Oromia Education Bureau were collected and analyzed to examine the alignment between policy intentions and classroom practices. Documents included the General Education Curriculum Framework [14], the New Education and Training Policy [15], ESDP VI [16], and regional assessment guidelines.

Ethical considerations

Ethical approval

was obtained from Oda Bultum University's Research Ethics Committee (Protocol No. OBU/EDU/2023/045). Written informed consent was obtained from all participants and, for students under 18 years, from their parents or legal guardians. Participants were assured of confidentiality, anonymity, and the right to withdraw at any time without consequence. All data were stored securely and accessed only by the research team. The study was conducted in full compliance with national and institutional guidelines for research involving human participants, including the Declaration of Helsinki.

Data collection instruments

Quantitative instrument

A structured questionnaire was developed based on a comprehensive review of existing assessment literature and validated instruments [1, 21, 31]. The instrument comprised 32 Likert-scale items (1 =

strongly disagree to 5 = strongly agree) aligned with six constructs (Table 1).

Table 1
Structure of the student questionnaire (32 items)

Scale	Subscale	Items	Focus and example item
Assessment practices	Cognitive-oriented	4	Questioning, quizzes, problem-solving tasks and performance-based evaluation requiring higher-order thinking (e.g., “My teacher uses quizzes and questions to check understanding during the lesson”)
	Social-oriented	4	Collaborative assessment, peer evaluation and group performance tasks (e.g., “Students assess each other’s work using clear criteria”)
	Emotional-oriented	4	Attention to students’ emotional experiences, supportive feedback and low-anxiety assessment environments
Learner competencies	Cognitive competence	7	Knowledge application, critical thinking and problem-solving
	Social competence	7	Communication, collaboration and relationship management
	Emotional competence	6	Emotional awareness, regulation and expression (e.g., “I can recognize and manage my emotions in class”)
Total		**32**	All items rated from 1 (strongly disagree) to 5 (strongly agree)

The full instrument is provided in Online Resource 1.

Instrument development and validation

The questionnaire was developed through a rigorous four-stage process

1. **Item generation**: Items were generated based on a review of existing validated instruments (e.g., [1, 31]) and adapted to the Ethiopian context through consultation with educational experts.
2. **Expert review**: A panel of three educational measurement specialists reviewed the items for content validity, clarity, and cultural appropriateness. The panel rated each item on a 4-point scale for relevance and clarity, and items with content validity index (CVI) below .80 were revised or eliminated. The final instrument demonstrated a scale-level CVI of .92.
3. **Pilot testing**: A pilot study (N = 45 students, 10 teachers from two schools not in the main sample) was conducted to refine item clarity, reduce ambiguous wording, and assess preliminary reliability. Pilot results indicated item-total correlations ranging from .41 to .69, and Cronbach’s α for each subscale exceeded .80.
4. **Confirmatory factor analysis**: Following data collection, confirmatory factor analysis (CFA) was conducted to establish construct validity. Model fit, factor loadings, composite reliability (CR) and average variance extracted (AVE) are summarized in Table 2.

Qualitative instrument: Semi-structured interview protocol (30–45 minutes per teacher) focusing on: (a) experiences with competency-based assessment, (b) challenges encountered, (c) contextual factors (resources, class size, school leadership), and (d) suggestions for improvement. The interview protocol was developed based on the study's research questions and relevant literature on assessment implementation [13, 38]. Interviews were conducted individually in private rooms at each school, audio-recorded, and transcribed verbatim in Afan Oromo (participants' choice), then translated into English by a certified translator. Back-translation was performed by a second translator to ensure accuracy, and discrepancies were resolved through discussion.

Document analysis protocol

A document analysis matrix was developed to systematically examine assessment guidelines, curriculum frameworks, and evaluation manuals for alignment with competency-based and multi-dimensional assessment principles. Documents were coded for explicit references to formative assessment, competency-based approaches, holistic development, and implementation guidance.

Validity, reliability and trustworthiness

Quantitative validity and reliability

Content validity was established through expert review (scale-level CVI = .92). Construct validity was supported by CFA, convergent validity by factor loadings and AVE values exceeding .50, and discriminant validity by three complementary criteria described below. Internal consistency reliability was assessed using Cronbach's α, with all subscales exceeding .82 in the full study (range .82–.91). Table 2 summarizes the evidence.

Table 2
Summary of validity and reliability evidence for the student questionnaire

Evidence	Criterion	Result
Model fit (CFA)	$\chi^2/df < 3$; CFI > .90; RMSEA < .08; SRMR < .08	$\chi^2/df = 2.45$; CFI = .94; RMSEA = .06; SRMR = .05
Factor loadings	> .50	.58–.82
Composite reliability (CR)	> .70	.83–.89
Average variance extracted (AVE)	> .50	.58–.67
Fornell–Larcker criterion	√AVE > inter-construct correlations	√AVE .76–.82; correlations .29–.56
HTMT ratio	< .85	.42–.71
Cronbach's α	—	.82–.91
Content validity index	Scale-level CVI; items < .80 revised	S-CVI = .92
Harman's single-factor test	First factor < 50% of variance	28.4%
Marker-variable correlations	Small and non-significant	*r* = − .04 to .08

Note. CFA = confirmatory factor analysis; HTMT = heterotrait–monotrait ratio; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual. The full correlation matrix, AVE values and HTMT ratios are provided in Online Resource 2.

Discriminant validity

Discriminant validity was established using three approaches. First, the Fornell-Larcker criterion was applied, with the square root of AVE for each construct (range .76–.82) exceeding its correlations with other constructs (range .29–.56). Second, the Heterotrait-Monotrait (HTMT) ratio was calculated, with all values (range .42–.71) below the .85 threshold recommended by Henseler et al. [41], confirming discriminant validity. Third, confidence intervals for inter-construct correlations did not include 1.0. These results confirm that assessment practices and learner competencies are empirically distinct constructs. The full correlation matrix, AVE values and HTMT ratios are provided in Online Resource 2.

Common method bias

Because all quantitative data were self-reported by students using a single questionnaire, Harman's single-factor test was conducted to assess common method bias. Results indicated that the first unrotated factor accounted for 28.4% of the variance, which is below the 50% threshold, suggesting that common method bias is not a significant concern [42]. Additionally, a marker variable (a theoretically unrelated construct—preference for visual learning materials) was included in the questionnaire;

correlations between the marker variable and substantive variables were small and non-significant (r range − .04 to .08), providing further evidence that common method bias did not substantially inflate observed relationships. However, as Podsakoff et al. [42] note, these tests are not definitive, and the possibility of shared-method bias cannot be entirely eliminated.

Qualitative trustworthiness

Qualitative trustworthiness was ensured through multiple strategies [43]

- **Credibility**: Triangulation (multiple data sources: students, teachers, documents, field notes), member checking (five teachers reviewed summary interpretations), and prolonged engagement in the field.
- **Transferability**: Rich, thick description of the research context and participants.
- **Dependability**: Systematic coding procedures, audit trail of analytical decisions, and inter-coder reliability.
- **Confirmability**: Reflexivity journal maintained by the researcher, peer debriefing with colleagues, and clear documentation of analytical procedures.

Inter-coder reliability

Two researchers independently coded 20% of the interview transcripts. Inter-coder reliability was calculated using Cohen's kappa, yielding $\kappa = .82$, indicating strong agreement. Discrepancies were resolved through discussion and consensus.

Saturation assessment

Saturation was assessed systematically following the procedure recommended by Guest et al. [44]. After every 10 interviews, the research team reviewed transcripts to determine whether new codes or themes were emerging. No new codes emerged after interview 48, and the full sample of 60 confirmed saturation. The final codebook contained 86 initial codes grouped into 5 final themes.

Data analysis

Quantitative analysis

Descriptive statistics (frequencies, percentages, means, standard deviations) were computed for all variables. Normality was assessed using skewness and kurtosis values (all within ± 2), and multivariate normality was assessed using Mardia's coefficient (critical ratio = 1.87, below the 5.0 threshold). Multiple regression analysis was conducted to examine the predictive relationships between assessment practices and learner competencies. Path analysis and structural equation modeling (SEM) using SPSS 26 and AMOS 26 were employed to test the hypothesized mediation model. Model fit was assessed using χ^2/df, CFI, TLI, RMSEA, and SRMR, with acceptable fit indicated by $\chi^2/df < 3$, CFI > .90, TLI > .90,

RMSEA < .08, and SRMR < .08 [40]. Mediation effects were tested using bias-corrected bootstrapping (5,000 resamples) to obtain 95% confidence intervals.

Qualitative analysis: Thematic analysis using NVivo 12 followed Braun and Clarke's [45] six phases: (1) familiarization with transcripts, (2) generating initial codes (open coding, 86 initial codes), (3) searching for themes (grouping codes into 15 candidate themes), (4) reviewing themes (collapsing to 5 final themes), (5) defining and naming themes, (6) writing the report.

Document analysis

Documents were analyzed using a directed content analysis approach [46], with coding categories derived from the study's conceptual framework (formative assessment, competency-based assessment, holistic development, implementation guidance).

Integration of quantitative and qualitative findings

A joint display matrix was developed to integrate quantitative and qualitative findings, identifying points of convergence, divergence, and elaboration [47]. This integration is presented in the Results section and discussed in relation to the research questions.

Results

Assessment approaches in use

Table 3 shows the assessment approaches reported by students.

Table 3
Types of assessment approaches practiced (*N* = 300)

Assessment approach	Frequency	Percentage of respondents
Formative assessment (quizzes, questioning, feedback)	192	64.0
Performance-based tasks and projects	141	47.0
Summative assessment	139	46.3
Portfolio assessment	118	39.3
Peer assessment	96	32.0
Self-assessment	82	27.3
Competency-aligned rubrics	74	24.7

Note. Percentages sum to more than 100% because respondents could select multiple assessment approaches.

Formative assessment was the dominant mode (64%), suggesting growing recognition of continuous assessment. However, limited use of peer assessment (32%), self-assessment (27%), and competency-aligned rubrics (25%) indicates that assessment remains largely teacher-directed.

Descriptive statistics and correlations

Table 4
Descriptive statistics and correlations among study variables (*N* = 300)

Variable	*M*	*SD*	Skewness	Kurtosis	1	2	3	4	5	6
1.Cognitive-oriented assessment	3.52	0.68	−0.31	0.18	—					
2.Social-oriented assessment	3.28	0.72	−0.24	−0.09	.48**	—				
3.Emotional-oriented assessment	3.19	0.75	−0.19	−0.12	.42**	.51**	—			
4.Cognitive competence	3.68	0.61	−0.42	0.31	.52**	.38**	.35**	—		
5.Social competence	3.44	0.66	−0.28	−0.15	.36**	.47**	.39**	.44**	—	
6.Emotional competence	3.39	0.71	−0.35	0.08	.33**	.41**	.49**	.40**	.46**	—

Note. All correlations are Pearson correlations. ** $p < .01$ (two-tailed).

Table 4 presents the descriptive statistics and correlations. Learners demonstrated higher cognitive competence ($M = 3.68$, $SD = 0.61$) compared to social ($M = 3.44$, $SD = 0.66$) and emotional ($M = 3.39$, $SD = 0.71$) competencies, suggesting that existing systems promote academic achievement more effectively than socio-emotional development. A mean of 3.68 on a 5-point scale indicates moderate cognitive competence. The correlation matrix reveals moderate to strong associations among all constructs (r range .33–.52), with the strongest correlation between cognitive-oriented assessment and cognitive competence ($r = .52$), consistent with theoretical expectations.

Multiple regression analysis

Table 5
Multiple regression results predicting holistic learner competence (N = 300)

Predictor	*B*	*SE B*	β	*t*	*p*	95% CI
Cognitive-oriented assessment	0.46	0.07	.41	6.57	< .001	[.32, .60]
Social-oriented assessment	0.33	0.08	.29	4.12	< .001	[.17, .49]
Emotional-oriented assessment	0.28	0.07	.26	3.89	< .001	[.14, .42]

Note. Model summary: R^2 = .427, adjusted R^2 = .421, $F(3, 296) = 73.53$, $p < .001$, f^2 = .75 (large effect). CI = confidence interval.

Assessment approaches collectively account for 42.7% of the variance in holistic learner competence. Cognitive-oriented assessment emerged as the strongest contributor (β = .41), while social and emotional-oriented assessments made significant unique contributions. The effect size (f^2 = .75) indicates a large practical significance.

Structural equation modeling

Measurement model. The CFA demonstrated acceptable fit, all factor loadings exceeded .50, and composite reliability and AVE values were above recommended thresholds (Table 2). Discriminant validity was supported by the Fornell–Larcker criterion and HTMT ratios (Table 2; Online Resource 2), indicating that assessment practices and learner competencies are empirically distinct constructs.

Structural model. The hypothesized structural model demonstrated acceptable fit (χ^2/df = 2.84, CFI = .93, TLI = .91, RMSEA = .07 [90% CI: .05, .09], SRMR = .06). The standardized paths are shown in Fig. 3 and Table 6.

Table 6
Standardized direct effects from the structural equation model

Pathway	Standardized β	*SE*	*p*	95% CI
Assessment practices → Cognitive competence	.52	.06	< .001	[.40, .64]
Assessment practices → Social competence	.37	.07	< .001	[.23, .51]
Assessment practices → Emotional competence	.33	.07	< .001	[.19, .47]
Assessment practices → Learner engagement	.48	.06	< .001	[.36, .60]
Learner engagement → Holistic competence	.44	.07	< .001	[.30, .58]
Cognitive competence → Holistic competence	.72	.05	< .001	[.62, .82]
Social competence → Holistic competence	.68	.06	< .001	[.56, .80]
Emotional competence → Holistic competence	.65	.06	< .001	[.53, .77]

Note. Model fit: $\chi^2/df = 2.84$, CFI = .93, TLI = .91, RMSEA = .07 (90% CI [.05, .09]), SRMR = .06. CI = confidence interval.

SEM results revealed strong direct effects of assessment practices on cognitive competence (β = .52) and significant pathways to social (β = .37) and emotional (β = .33) competencies. Learner engagement served as a significant mediator (β = .44 to holistic competence). The second-order factor model confirmed that cognitive, social, and emotional competencies load significantly on a higher-order holistic competence factor (loadings .65–.72).

Mediation analysis

Table 7
Mediation analysis results

Pathway	Direct effect	Indirect effect	Total effect	% mediated	95% CI for indirect effect
Assessment → Academic performance (via emotional competence)	.19	.12	.31	39	[.07, .18]
Assessment → Holistic competence (via learner engagement)	.28	.21	.49	43	[.14, .28]

Note. Indirect effects were estimated using bias-corrected bootstrapping with 5,000 resamples. Percentage mediated = (indirect / total) × 100. For emotional competence: (.12 / .31) × 100 = 38.7% ≈ 39%. For learner engagement: (.21 / .49) × 100 = 42.9% ≈ 43%.

Emotional competence served as a partial mediator, with an indirect effect of .12 (95% bias-corrected bootstrap CI [.07, .18]), accounting for approximately 39% of the total effect of assessment practices on

academic performance. Learner engagement also served as a significant partial mediator, with an indirect effect of .21 (95% CI [.14, .28]), accounting for 43% of the total effect on holistic competence.

Explanation of two mediation models. The study tested two distinct mediation models corresponding to different outcomes. The first model examined emotional competence as a mediator between assessment practices and academic performance, reflecting the theoretical pathway proposed by control-value theory [28, 29]: assessment practices shape students' emotional experiences, which in turn influence academic achievement. The second model examined learner engagement as a mediator between assessment practices and holistic competence, reflecting the theoretical pathway proposed by self-determination theory [26, 27]: assessment practices that support autonomy, competence, and relatedness enhance engagement, which in turn fosters holistic development. These models are complementary rather than competing, addressing different aspects of the assessment–development relationship.

Qualitative results: contextual barriers

Thematic analysis of the interview data yielded five themes describing contextual barriers to implementation (Table 8).

Table 8
Contextual barriers to implementing multi-dimensional and competency-based assessment

Theme	Description	Illustrative quote
Limited teacher preparation	Insufficient pre-service and in-service training in competency-based assessment design, scoring rubrics and feedback provision	"We know competency-based assessment is important, but without training and with 60 students per class, how can we implement peer assessment and individualized feedback meaningfully?" (Teacher 12, male, 12 years' experience)
Teachers' commitment and dedication	Variability in motivation due to heavy workloads (average class size 55–65 students) and limited incentives	"The workload is overwhelming. We have to prepare lessons, mark assignments, and manage large classes. There is no time for innovative assessment." (Teacher 34, female, 8 years' experience)
Resource shortages	Lack of assessment materials (rubrics, exemplars, portfolios), photocopying constraints, large class sizes	"We don't even have enough paper for tests, let alone portfolios or rubrics for each student. The district says 'implement competency-based assessment' but gives no materials." (Teacher 21, male, 5 years' experience)
Inconsistent school-level support	Weak instructional leadership, infrequent classroom observation, lack of professional learning communities	"The school leadership does not prioritize assessment. There is no follow-up, no feedback, no professional development." (Teacher 45, female, 15 years' experience)
Examination-oriented system	Misalignment with high-stakes national exams (Grades 10 and 12), which focus on factual recall	"The national exam at the end of grade 10 and 12 determines everything. Teachers focus on what will be tested, not on social or emotional skills." (Teacher 34, female, 8 years' experience)

Document analysis findings

Analysis of national and regional assessment guidelines revealed a significant gap between policy intentions and implementation guidance. While the New Education and Training Policy [15] and ESDP VI [16] articulate strong commitments to competency-based assessment and holistic development, the operational documents provided to schools lacked specific guidance on designing competency-aligned rubrics, implementing peer and self-assessment, or documenting holistic development. The Grade 10 and 12 examination frameworks focused predominantly on cognitive outcomes measured through paper-and-pencil tests, creating a misalignment between classroom assessment reforms and high-stakes accountability systems.

Integration of quantitative and qualitative findings

Table 9 presents the joint display integrating the quantitative and qualitative findings.

Table 9
Joint display of quantitative and qualitative findings

Quantitative finding	Qualitative explanation	Integration
Formative assessment most common (64%); peer/self-assessment less common (27–32%)	Teachers report lack of training and materials for implementing peer/self-assessment; examination pressure focuses attention on teacher-directed methods	Quantitative findings are explained by qualitative barriers: limited training and resources constrain implementation of student-centered assessment
Assessment practices predict cognitive competence (β = .52) more strongly than social (β = .37) or emotional (β = .33) competence	Teachers prioritize cognitive outcomes due to examination pressure; socio-emotional assessment is not well understood or supported	Qualitative findings explain the differential effects: the examination-oriented system channels assessment toward cognitive outcomes
Learner engagement mediates assessment → holistic competence (β = .44)	Teachers note that when students are engaged through formative feedback, they invest more in learning	Qualitative findings corroborate the mediating role of engagement: meaningful assessment fosters student investment
Emotional competence mediates assessment → academic performance (indirect = .12, 39%)	Teachers observe that supportive assessment reduces anxiety and builds confidence, which helps academic performance	Qualitative findings elaborate the emotional pathway: supportive assessment creates positive emotional experiences that enhance learning

Discussion

This study provides empirical evidence that multi-dimensional and competency-based assessment approaches were significantly associated with secondary school learners' cognitive, social, and emotional competencies in West Hararghe Zone. The findings offer both confirmatory evidence for established assessment principles and novel insights into their application in a low-resource African context.

Interpretation of key findings

The predominance of formative assessment practices (64%) suggests a gradual shift toward learner-centered evaluation, consistent with assessment for learning principles [1]. This finding aligns with policy commitments in Ethiopia's New Education and Training Policy [15] and ESDP VI [16], which emphasize continuous assessment as a core pedagogical strategy. However, the limited application of competency-aligned rubrics (25%) and self-/peer assessment indicates that implementation remains partial and largely teacher-directed. This pattern is consistent with findings from other Sub-Saharan African contexts, where formative assessment is increasingly recognized but often implemented in superficial ways that do not fully realize its potential [10, 11].

Assessment practices were most strongly related to cognitive competence (β = .52 in the structural model), and cognitive-oriented assessment was the strongest unique predictor of holistic learner competence in the regression model (β = .41). This is consistent with prior research showing that formative feedback, authentic tasks, and performance-based evaluations enhance higher-order thinking [3, 21, 31]. The finding is particularly significant in the Ethiopian context, where traditional examinations have been criticized for emphasizing rote memorization over critical thinking [19]. The results suggest that even in resource-constrained environments, assessment practices that engage students in active demonstration of understanding are associated with stronger cognitive development.

Cognitive-oriented assessment and cognitive competence are conceptually distinct but related constructs: cognitive-oriented assessment refers to the practices teachers use to elicit and evaluate students' cognitive skills, whereas cognitive competence refers to students' actual cognitive abilities. The associations observed (β = .41 in the regression model and β = .52 in the structural model) do not represent tautology but are consistent with the view that assessment practices aligned with cognitive outcomes are related to cognitive development, in line with the assessment literature on alignment between learning objectives and assessment methods [48]. The discriminant validity analyses (Fornell–Larcker criterion and HTMT ratio) further indicated that these are empirically distinct constructs, with AVE values exceeding squared inter-construct correlations and HTMT ratios below .85. The observed relationships therefore appear to reflect substantive associations between distinct constructs rather than measurement overlap.

Social-oriented (β = .29) and emotional-oriented (β = .26) assessment made smaller, though significant, unique contributions to holistic competence, and in the structural model assessment practices had weaker paths to social (β = .37) and emotional (β = .33) competence than to cognitive competence (β = .52). These domains appear to require more intentional integration into assessment design. The qualitative findings explain this pattern: teachers reported that examination pressure focuses attention on cognitive outcomes, while socio-emotional assessment is neither well understood nor supported by available materials. This finding resonates with the broader literature on assessment reform, which has documented the difficulty of shifting assessment cultures in systems dominated by high-stakes examinations [13, 38].

The mediating role of learner engagement (β = .44 to holistic competence) provides empirical support for theoretical models positioning engagement as a central mechanism linking assessment practices to learning outcomes [21, 22]. When students experience assessment as meaningful and supportive, they invest more cognitive and emotional resources in learning, which in turn fosters holistic development. This finding has practical implications: efforts to improve assessment should focus not only on the technical quality of assessment tools but also on creating conditions that foster student engagement.

Similarly, the partial mediation by emotional competence (indirect effect = .12, 39% of total effect) reinforces evidence on the interdependence between emotional well-being and cognitive achievement [27, 29]. When students experience assessment as supportive rather than threatening, positive emotions

enhance cognitive processing and academic performance. This finding is particularly significant in the Ethiopian context, where examination anxiety and fear of failure are common concerns [19]. The results suggest that assessment reform that attends to students' emotional experiences can have benefits beyond academic achievement, contributing to their overall well-being and engagement with learning.

Contextual barriers and implementation challenges

The contextual barriers identified—limited teacher preparation, heavy teacher workloads and limited incentives, resource shortages, examination-oriented accountability, and inconsistent school-level support—reflect challenges widely documented in low-resource educational settings [12, 13, 49]. The qualitative findings provide rich insight into how these barriers operate in the West Hararghe context. Teachers' workload and limited incentives were an additional constraint: with large classes of 55–65 students, teachers described having little time or motivation to adopt time-intensive practices such as portfolios, peer assessment and individualized feedback, a pattern also reported in studies of competency-based curriculum reform in East Africa [10].

The lack of teacher preparation emerged as a fundamental constraint. Teachers reported that they had received little or no training in competency-based assessment design, rubric development, or feedback provision. This finding is consistent with research documenting inadequate assessment literacy among teachers in many developing countries [18, 38]. Without adequate preparation, teachers are unlikely to implement the complex practices required for multi-dimensional assessment, even when they understand their value.

Resource shortages including lack of assessment materials, photocopying constraints, and large class sizes create practical barriers to implementing assessment approaches that require individualized feedback and documentation. The average class size of 55–65 students makes it difficult for teachers to provide the kind of personalized feedback that research has shown to be effective [21]. These resource constraints are not unique to West Hararghe but reflect broader challenges facing education systems in low-income countries [12].

The examination-oriented system emerged as a structural barrier that individual teacher training alone cannot resolve. Teachers reported that the Grade 10 and 12 national examinations, which focus on factual recall, create strong incentives to prioritize examination preparation over holistic assessment. This misalignment between classroom assessment reforms and high-stakes accountability systems is a well-documented challenge in assessment reform efforts globally [1, 13]. The finding underscores the need for systemic reform that addresses both classroom practices and the broader accountability architecture.

Theoretical implications

The findings provide empirical support for the study's conceptual framework, which posited that assessment practices influence learner competencies through both direct and mediated pathways. The

strong direct effects of assessment practices on cognitive, social, and emotional competencies support the constructivist premise that assessment is not merely a measurement tool but a learning experience that shapes what students learn and how they develop [2, 24].

The mediating role of learner engagement aligns with self-determination theory [27], which emphasizes the importance of autonomy, competence, and relatedness in fostering intrinsic motivation. Assessment practices that provide meaningful feedback, offer choices, and recognize individual progress support these needs, thereby enhancing engagement and deeper learning.

The mediating role of emotional competence aligns with control-value theory [29], which explains how assessment experiences shape learners' emotional states and subsequent academic performance. The finding that supportive assessment can enhance emotional competence, which in turn improves academic performance, underscores the importance of attending to the affective dimensions of assessment.

Implications and recommendations

The findings have implications for practice, policy and research, and the study makes the following recommendations:

1. **Teacher professional development**: Targeted professional development programs are needed to enhance teachers' assessment literacy in designing and implementing competency-based assessments. Such programs should emphasize rubric design, peer assessment facilitation, and feedback strategies, and should provide opportunities for teachers to practice these skills in supportive environments. Given the finding that teachers lack preparation in competency-based assessment, professional development should be prioritized as a foundational intervention.
2. **Resource allocation**: Improved allocation of pedagogical and assessment resources is essential. This includes providing materials for portfolios and rubrics, reducing class sizes to manageable levels, and ensuring access to photocopying and other instructional resources. The qualitative findings indicate that current class sizes (55–65 students) impede implementation of individualized assessment practices. The study did not establish a specific threshold for class size; further research is needed to determine optimal class sizes for competency-based assessment in this context.
3. **School-level support**: Strengthened school-level support mechanisms are needed, including instructional leadership training and establishment of collaborative teacher communities (professional learning communities) focused on assessment. School leaders should be equipped to provide meaningful feedback and support to teachers as they implement new assessment practices.
4. **Policy alignment**: Policy alignment between curriculum, classroom assessment, and high-stakes examination systems is critical. Without changes to examination systems that currently emphasize factual recall, teachers will continue to face strong incentives to prioritize examination preparation

over holistic assessment. Revising examination frameworks to include competency-based items and reducing the dominance of factual recall are recommended.

5. **Future research** exploring longitudinal effects of competency-based assessment, testing the conceptual model across multiple Ethiopian regions, and examining student and parent perspectives. Research should also investigate the effectiveness of specific professional development models and the conditions under which competency-based assessment is most effective.

Limitations

Several limitations should be acknowledged. First, the cross-sectional design precludes causal inferences; longitudinal studies are needed to establish directionality. While the study's hypotheses were grounded in theory and the SEM model demonstrated acceptable fit, the possibility of reverse causation or omitted variables cannot be ruled out. The mediation findings should be interpreted as "consistent with" rather than "demonstrating" mediating mechanisms. Future research employing longitudinal or experimental designs is needed to establish causal relationships.

Second, all quantitative data were self-reported by students, introducing potential common method bias [42]. Although Harman's single-factor test (first factor = 28.4% of variance) and marker variable analysis (non-significant correlations) suggested that common method bias was not a major concern, the possibility of shared-method bias cannot be entirely eliminated. Future research should incorporate objective measures of competency (e.g., standardized performance assessments, teacher ratings, direct observations) and multi-informant data to strengthen validity.

Third, while inter-coder reliability was established for the qualitative analysis ($\kappa = .82$), the study relied primarily on one researcher for data collection and initial coding. Co-coding with a second researcher throughout the analysis would further strengthen trustworthiness.

Fourth, the study focused on secondary schools in one zone of Oromia, limiting generalizability to other Ethiopian regions or countries. The specific contextual conditions of West Hararghe—large class sizes, limited resources, examination-oriented system—may differ from other settings. Additionally, the exclusion of 4 schools due to accessibility constraints may introduce selection bias, as the most remote and resource-constrained schools were not represented. Finally, the achieved student sample ($n = 300$) was slightly below the calculated minimum of approximately 333, corresponding to a margin of error of about 5.3% rather than 5%.

Fifth, the study did not include teachers as participants in the quantitative phase, which limits the comprehensiveness of the findings. Teachers are central actors in assessment practices, and their perspectives would provide valuable insight into implementation challenges and opportunities.

Sixth, the mediation analysis, while statistically significant, is based on cross-sectional data and should be interpreted with caution. The indirect effects observed may not represent true causal mediation. The

use of bias-corrected bootstrapping provides robust estimates of indirect effects, but temporal precedence cannot be established.

Despite these limitations, the study provides valuable evidence on the implementation and effects of competency-based and multi-dimensional assessment in a low-resource context. The mixed-methods design, integration of quantitative and qualitative findings, and attention to contextual factors represent significant strengths.

Conclusions

This study provides empirical evidence that multi-dimensional and competency-based assessment approaches were significantly associated with secondary school learners' cognitive, social, and emotional competencies in West Hararghe Zone, Ethiopia. Integrated assessment systems that move beyond traditional examinations were associated with greater learner engagement and holistic competence. Emotional competence serves as a partial mediator, highlighting the importance of attending to students' affective experiences in assessment design.

The findings have important implications for assessment reform in low-resource contexts. While policy commitments to competency-based assessment are essential, they are insufficient without attention to teacher preparation, resource allocation, school-level support, and alignment with examination systems. Addressing these systemic barriers requires coordinated interventions at multiple levels.

The study contributes to the international literature on assessment reform by providing contextually grounded evidence from an under-researched setting. It demonstrates that the principles of competency-based and multi-dimensional assessment are relevant and potentially transformative in low-resource contexts, but their implementation requires careful attention to local conditions and constraints.

Declarations

Ethics approval and consent to participate

This study was approved by the Research Ethics Committee of the College of Education, Oda Bultum University, Ethiopia (protocol number OBU/EDU/2023/045), in accordance with the Declaration of Helsinki and the institutional research guidelines of Oda Bultum University. Informed consent was obtained from all participants before they took part in the study. Participation was voluntary, and participants were informed about the purpose of the study, their right to withdraw at any time, and the confidential nature of the data collected. For students under 18 years, consent was obtained from parents or legal guardians.

Consent for publication

Not applicable. This manuscript does not contain any individual person's data in any form.

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that there are no financial or non-financial competing interests.

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Authors' contributions

All authors read and approved the final manuscript.

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Figures

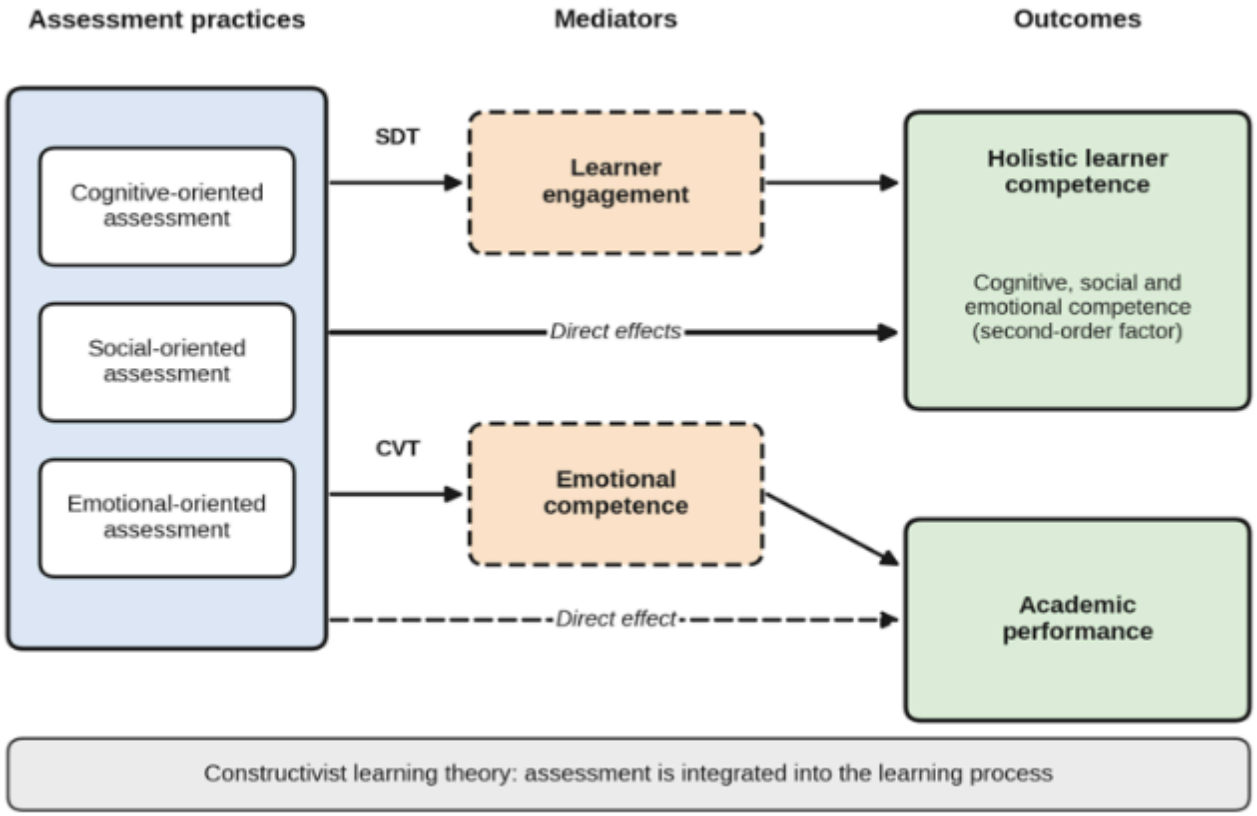

Figure 1

Conceptual framework of the study. Cognitive-, social- and emotional-oriented assessment practices are hypothesized to influence holistic learner competence and academic performance directly and indirectly through learner engagement and emotional competence. Solid boxes denote predictors and outcomes; dashed boxes denote mediators. SDT = self-determination theory; CVT = control-value theory

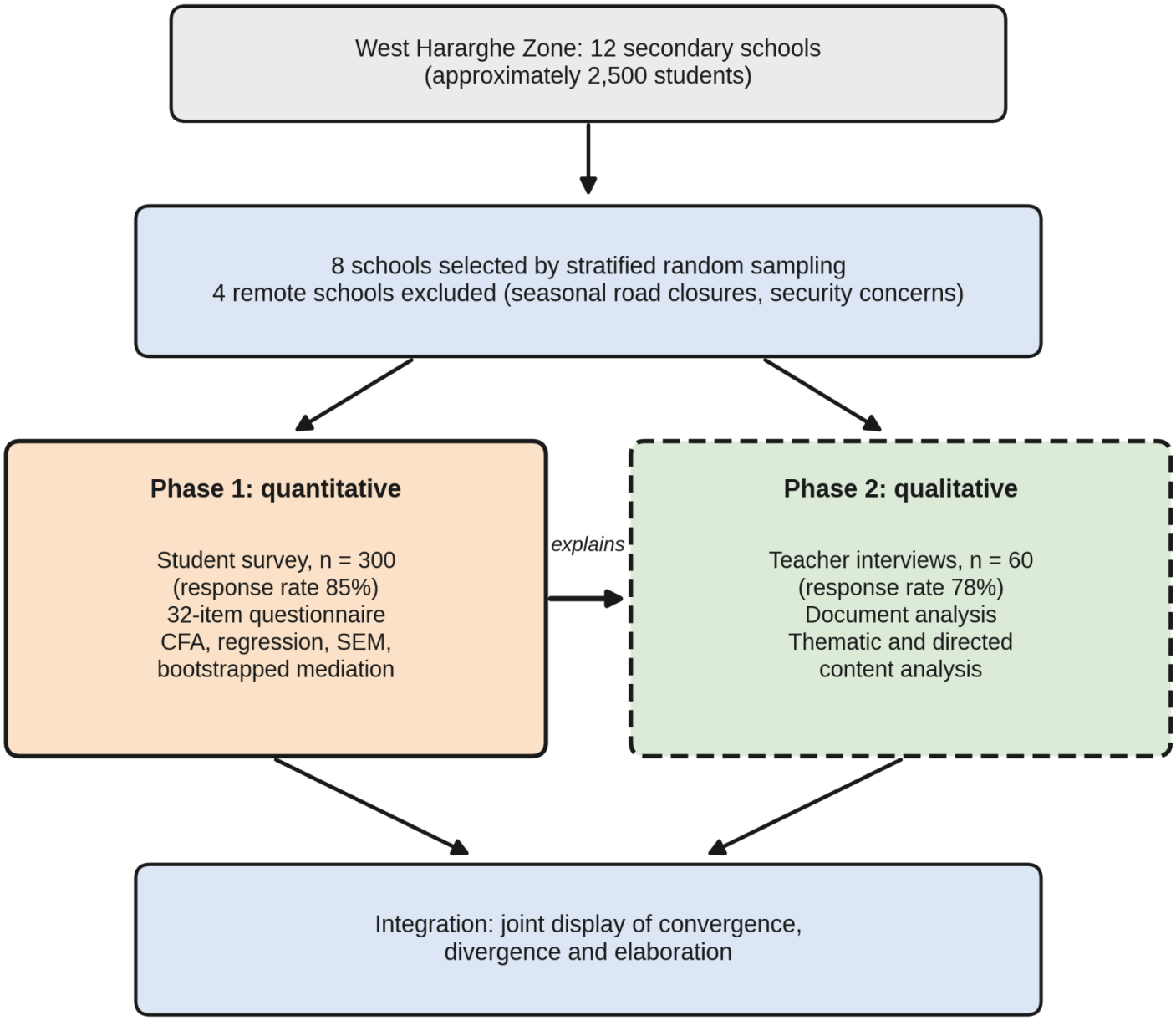

Figure 2

Explanatory sequential mixed-methods design and sampling flow. The quantitative phase (student survey) was followed by the qualitative phase (teacher interviews and document analysis) to explain the quantitative results; findings were integrated in a joint display

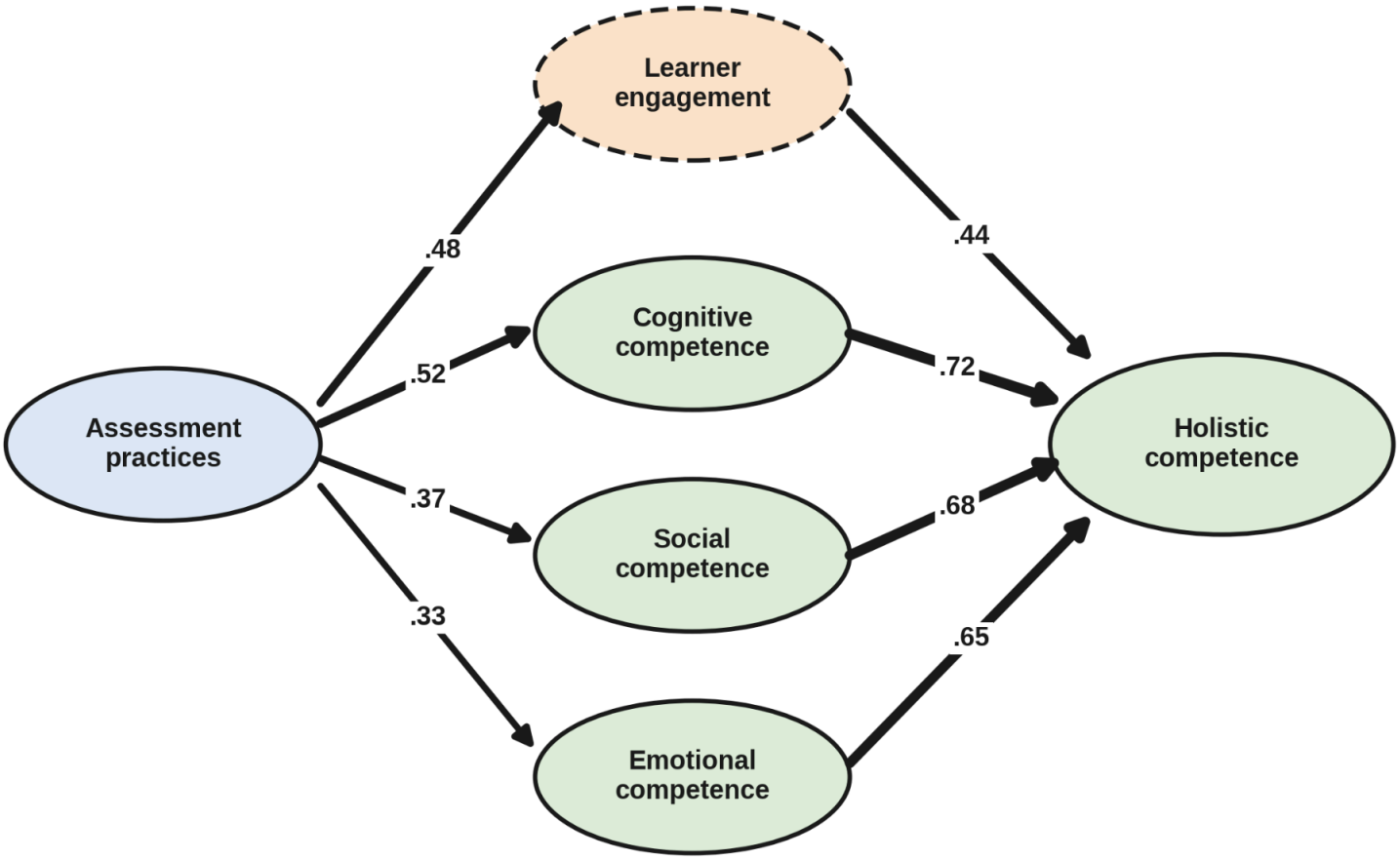

Figure 3

Structural model with standardized path coefficients (all $p < .001$). Line thickness is proportional to the coefficient. The dashed ellipse denotes the mediator. Model fit: $\chi^2/df = 2.84$, CFI = .93, TLI = .91, RMSEA = .07, SRMR = .06