



Exploring the ASPIRE Framework: Enhancing Assessment Literacy through Inquiry-Based Teacher Education

Ronald M. Quileste^{1*}, Charity Rose A. Pagara¹, Maria Leah Paola M. Estacio¹

¹School of Education, Xavier University - Ateneo de Cagayan, Cagayan de Oro City, Philippines

Article History:

Received: May 21, 2025

Revised: June 11, 2025

Accepted: September 07, 2025

Published: October 07, 2025

Keywords:

ASPIRE Framework,
Inquiry-based Learning,
Assessment Literacy,
Teacher Education,
Mixed-methods Research

*Correspondence Author:

rquileste@xu.edu.ph

Abstract: Assessment literacy remains underdeveloped in many teacher education programs, with limited use of inquiry-based approaches. No empirical studies have applied the 5Es model specifically to assessment education, particularly in resource-constrained contexts. This mixed-methods study introduces the ASPIRE Framework (Assessment through Structured Pedagogy, Inquiry, and Reflective Engagement), an adaptation of the 5Es model integrating constructivist principles and the Filipino value of *bayanihan*. Implemented in a Philippine teacher education course ($n = 29$ pre-service teachers), ASPIRE was evaluated through surveys, a validated pretest-posttest, interviews, and assignment analysis. Engagement remained consistently high across phases ($M = 3.64 - 3.75/4$), and learning scores improved significantly by 9.22 points ($Z = -3.96$, $p < 0.001$, $r = 0.73$), indicating a substantial impact. Qualitative findings highlighted clarity, practicality, and strong collaborative learning, though time constraints limited group activities during the Explore phase. The framework's low-resource design suggests adaptability in similar Southeast Asian settings. While results provide preliminary evidence that culturally responsive, inquiry-driven pedagogy can enhance assessment literacy, the small sample and single-course context limit generalizability. Future research should examine scalability across disciplines, compare ASPIRE with traditional approaches, and explore adaptations for diverse educational and cultural contexts.

INTRODUCTION

Assessment literacy the ability to design, implement, and evaluate valid and reliable assessments is a cornerstone of effective teaching and equitable learning outcomes (Cruz, 2021; Popham, 2018). In the Philippines, this competency is mandated in the Philippine Professional Standards for Teachers (PPST), particularly Domain 5 (Assessment and Reporting) and Strand 5.1, which require teachers to select, develop, and apply assessment strategies aligned with intended learning outcomes (Brevik et al., 2017; Volante & DeLuca, 2020). Similar competencies are also being emphasized globally, underscoring the importance of universal assessment in meeting diverse student needs and supporting lifelong learning both now and in the future.

Despite this prominence in policy, assessment literacy remains a persistent challenge in practice, particularly in resource-constrained educational systems. Teacher education courses often rely on lecture-based instruction, emphasizing theoretical definitions over

authentic, practice-oriented learning (DeLuca & Volante, 2016; Fountain, 2021). This approach may build conceptual understanding but often leaves pre-service teachers underprepared for the complexities of designing and evaluating assessments in real classrooms. Studies in Southeast Asia, for example, have found widespread misconceptions about assessment validity and reliability, with nearly half of pre-service teachers unable to produce reliable classroom tests (Tan, 2023). These issues are compounded in the Philippine context, where large class sizes and shortages of instructional materials limit opportunities for interactive, hands-on learning (Cruz, 2021).

Efforts to improve assessment literacy have included collaborative learning and problem-based learning models, but results vary depending on contextual factors such as infrastructure, cultural norms, and teacher readiness. In Southeast Asian contexts, inquiry-based teaching and learning (IBTL) often faces entrenched teacher-centered traditions, hierarchical classroom dynamics, and insufficient policy support. These barriers limit sustainability and adoption, highlighting the need for instructional frameworks that are not only pedagogically sound but also sensitive to local cultural values and practical constraints.

Globally, inquiry-based approaches have gained recognition as effective alternatives to didactic methods. Among these, the 5Es learning cycle Engage, Explore, Explain, Elaborate, Evaluate has been widely applied in science and mathematics education to promote higher-order thinking, conceptual mastery, and learner engagement (Bybee et al., 2006; Lee & Kim, 2022). However, the model's application to assessment literacy is virtually absent from the literature. Designing inquiry-based tasks for abstract assessment concepts, such as validity and reliability, is often perceived as difficult (Conklin, 2017), and the prevalence of lecture-based instruction in teacher education further impedes adaptation (Hayes, 2022). This absence represents a critical gap in both theory and practice: to date, no empirical studies have adapted the 5Es model specifically to develop assessment literacy among pre-service teachers, particularly in low-resource settings.

To address this gap, this study introduces the ASPIRE Framework Assessment through Structured Pedagogy, Inquiry, and Reflective Engagement which reconfigures the 5Es model to align with assessment literacy goals while embedding culturally responsive strategies. Unique to ASPIRE is the integration of the Filipino cultural value of *bayanihan* (community collaboration) into the Explore phase, fostering peer-led inquiry and shared problem-solving in designing assessments. The framework operationalizes constructivist principles across its sequential phases to facilitate deep and meaningful learning. In the Engage phase, learners are introduced to authentic, real-world scenarios that stimulate curiosity and activate prior knowledge. The Explore phase encourages collaborative investigation and experiential learning, allowing students to construct understanding through hands-on inquiry and peer interaction. During the Explain phase, conceptual understanding is scaffolded through guided discussion, instructor feedback, and the integration of theoretical insights. The Elaborate phase bridges theory and practice by engaging learners in applied design or problem-solving tasks that extend and contextualize their knowledge. Finally, the Evaluate phase fosters reflective practice and metacognitive awareness, enabling learners to assess their growth, refine their understanding, and

internalize key concepts for future application. The Mapping of Constructivism, 5Es, and the ASPIRE Framework can be seen in Table 1.

Table 1. Mapping Constructivism, 5Es, and ASPIRE Framework

Constructivist Principle	5Es Phase	ASPIRE Phase	Implementation in ASPIRE
Active knowledge construction	Engage	Engage	Case studies on assessment scenarios (e.g., designing valid tests) spark curiosity and contextual learning.
Social collaboration	Explore	Explore	Peer-led group inquiries, leveraging <i>bayanihan</i> , develop assessment designs through collaborative problem-solving.
Scaffolding learning	Explain	Explain	Structured discussions and lectures clarify complex assessment concepts like reliability and validity.
Reflective practice	Elaborate	Elaborate	Projects bridge theoretical concepts to practical assessment applications, such as rubric creation.
Self-regulated learning	Evaluate	Evaluate	Reflective journals and self-assessments foster critical reflection and skill refinement.

Building on this mapping, the study's conceptual framework illustrates hypothesized relationships between ASPIRE phases, engagement, learning outcomes, perceptions, and challenges.

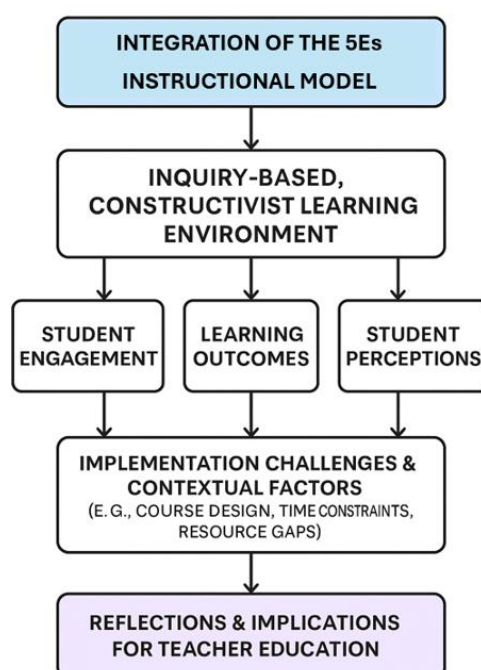


Figure 1. The ASPIRE Framework for Assessment Education

Given its low-resource, culturally grounded design, ASPIRE has potential applicability beyond the Philippines, particularly in other developing-country contexts where teacher preparation faces similar resource and cultural challenges. The present study implements ASPIRE in Assessment of Learning 1, a core teacher education course at Xavier University–Ateneo de Cagayan, to examine its potential to enhance assessment

literacy through inquiry-based, culturally relevant pedagogy. Specifically, it seeks to: (a) measure ASPIRE's effects on engagement, learning gains, and perceptions; (b) explore perceived benefits and implementation challenges in a resource-constrained higher education context; and (c) generate recommendations for adapting ASPIRE to diverse disciplines and educational settings.

REVIEW OF RELATED LITERATURE

Assessment Literacy in Teacher Education

Assessment literacy is widely recognized as a core professional competency for teachers, encompassing the knowledge, skills, and dispositions needed to design, implement, and interpret valid and reliable assessments (Popham, 2018; Cruz, 2021). In the Philippine Professional Standards for Teachers (PPST), this competency is embedded in Domain 5 (Assessment and Reporting), which emphasizes the selection and creation of assessments aligned with intended learning outcomes (Brevik et al., 2017; Volante & DeLuca, 2020). Comparable standards exist globally, reflecting the consensus that teachers must be able to adapt assessments to diverse learners and contexts.

However, existing assessment literacy frameworks often adopt a conventional, checklist approach that may not fully reflect the complex, socio-cultural nature of assessment practices (DeLuca et al., 2023). Teacher assessment literacy is continuously developing through ongoing, contextualized professional learning, which customary standards may overlook. Furthermore, reliance on self-report measures raises concerns of bias and may exaggerate teachers' actual competence (Pastore et al., 2023). Lastly, systemic challenges such as large class sizes and limited resources can further restrict teachers' ability to apply their knowledge effectively, emphasizing the need for support beyond individual skill development.

Despite policy emphasis, research consistently reports that pre-service teachers often lack confidence and proficiency in practical assessment design. Lecture-dominated courses tend to focus on theoretical definitions, resulting in limited application skills and persistent misconceptions (DeLuca & Volante, 2016; Fountain, 2021). In the Philippine context, Tan (2023) found that 45% of pre-service teachers could not produce reliable classroom tests, while 60% expressed low confidence in creating formative assessments. Such challenges are compounded by systemic issues large class sizes, resource shortages, and limited opportunities for applied learning (Cruz, 2021; Smith et al., 2022).

Inquiry-Based Learning and the 5Es Model

Inquiry-based learning (IBL) has emerged as a promising approach to addressing these gaps by engaging learners in active exploration, problem-solving, and reflection (Cochran-Smith & Lytle, 2019). Among IBL models, the 5Es Engage, Explore, Explain, Elaborate, Evaluate developed in science education (Bybee et al., 2006), has demonstrated positive effects on engagement, conceptual understanding, and skill transfer (Alozie & Sadiq, 2020; Lee & Kim, 2022).

However, its application in assessment education remains virtually absent. A targeted search of peer-reviewed literature revealed no empirical studies employing the

5Es model in relation to assessment literacy among pre-service teachers Possible reasons include difficulties in creating inquiry activities for abstract constructs such as validity and reliability (Conklin, 2017) and the dominance of didactic traditions in teacher preparation (Hayes, 2022). These barriers have perpetuated the separation between innovative inquiry models and assessment-focused courses.

Culturally Responsive Pedagogy and Bayanihan

Culturally responsive teaching aligns instructional practices with learners' cultural backgrounds to improve relevance, engagement, and learning outcomes (Gay, 2018). Social interdependence theory underpins cooperative learning strategies, where positive interdependence and shared goals enhance achievement (Johnson et al., 2014). In the Philippines, the cultural value of *bayanihan* is an ethos of communal spirit, collective support and selfless cooperation without expectation of reward. It embodies the principles of positive social interdependence. Furthermore, *bayanihan* emphasizes unity of thought and action, mutual aid, and a shared commitment to common goals, which is comparable to the social interdependence framework fostering collaboration for the common good.

Integrating *bayanihan* into collaboration theories strengthens culturally responsive teaching and enriches cooperative learning by incorporating cultural motivation. Research shows that structured collaboration can improve learning outcomes by 15–20% (Goos & Moni, 2021; Krämer et al., 2019). However, much of the existing work relies on self-reported engagement measures, which risk bias. Mixed-methods designs, combining surveys with direct performance measures, provide stronger evidence of impact (Aditomo & Klieme, 2020).

Low-Resource Contexts and Global Relevance

Education in resource-constrained environments such as the Philippines faces distinct challenges, with approximately 70% of schools lacking adequate teaching materials (Tan, 2023). Similar limitations characterise many education systems in Africa and Latin America, where infrastructural and material shortages may also impede the implementation of inquiry-based pedagogies (Ugwu & Ezeokoli, 2022; Mumba & Chabalengula, 2021). Recognizing this, low-cost, active learning strategies such as case-based learning, peer collaboration, and reflective practice have been proposed and tested with varying success, improving teacher capacity without heavy infrastructure demands.

Such low-resource approaches also aligns with UNESCO's Sustainable Development Goal 4 (SDG 4), which calls for innovative and scalable teacher-education models in developing countries (UNESCO, 2022).

Positioning the ASPIRE Framework

The ASPIRE Framework, as presented in Figure 1 illustrates the ASPIRE cycle, integrating assessment through Structured Pedagogy, Inquiry, and Reflective Engagement, addresses the documented gaps by adapting the 5Es model for assessment literacy and embedding *bayanihan*-based collaboration into its Explore phase

Unlike prior models, ASPIRE explicitly targets the intersection of inquiry-based pedagogy, cultural responsiveness, and feasibility in low-resource environments. Its design draws from constructivist theory, emphasizing active knowledge construction, scaffolding, and reflection, while ensuring cultural alignment and low material cost. By integrating theory, cultural context, and practical constraints, ASPIRE contributes a novel, contextually grounded model for enhancing assessment literacy. This study represents the first empirical test of ASPIRE in a Philippine teacher education setting, providing initial evidence of its effectiveness and informing its potential adaptation for broader international use.

METHOD

This study employed a convergent parallel mixed-methods design (Creswell & Plano Clark, 2018) to evaluate the efficacy of the ASPIRE Framework an adaptation of the 5Es instructional model integrating culturally responsive strategies for enhancing assessment literacy among pre-service teachers. Quantitative and qualitative data were collected simultaneously, analyzed separately, and then integrated to provide a comprehensive understanding of ASPIRE's impact. This design was chosen to capture both measurable learning gains and nuanced perceptions of engagement, collaboration, and practical challenges. Data sources included a validated pretest–posttest assessment, an engagement survey, semi-structured interviews, and analysis of student assignments. The study context a resource-constrained Philippine teacher education program provided a relevant setting to examine ASPIRE's potential scalability to similar environments.

The participants were 29 pre-service teachers enrolled in Assessment of Learning 1, a three-unit core course in the teacher education program at Xavier University Ateneo de Cagayan, Philippines, during the August–December 2024 semester. The cohort comprised two intact sections EDA ($n = 15$) and EDB ($n = 14$) all of whom experienced the ASPIRE-integrated curriculum. Purposive sampling was used to include all enrolled students, minimizing self-selection bias and ensuring that findings reflected the full class population. The study was conducted in a resource-constrained higher education context characterized by large student teacher ratios in many courses and limited access to instructional materials, mirroring challenges faced in other developing-country settings (Tan, 2023). Culturally, the Philippine concept of *bayanihan* (community collaboration) informed the design of collaborative learning activities within the ASPIRE framework. All participants provided written informed consent prior to the study. Ethical clearance was obtained from the Xavier University Institutional Review Board, and the research followed international guidelines for educational research ethics.

Four complementary instruments were used to enable triangulation and reduce the limitations of self-report measures (Aditomo & Klieme, 2020). First, a 20-item engagement survey adapted from Alozie and Sadiq (2020) measured student engagement across ASPIRE's phases on a 4-point Likert scale (1 = Strongly Disagree, 4 = Strongly Agree). Items included statements such as "Engage phase activities sparked my interest" and "Evaluate phase activities supported self-assessment." Second, a 60-item pretest–posttest assessment, aligned with a Table of Specifications (ToS) covering key concepts in

assessment literacy such as validity, reliability, and test design was administered to measure learning gains. The ToS was validated by two assessment experts, and item revisions were made based on their feedback. Third, semi-structured interviews with ten purposively selected participants from both sections explored perceptions of ASPIRE's clarity, practicality, and collaborative processes. The interview guide was reviewed by three qualitative research experts for clarity and alignment. Fourth, student outputs from ASPIRE-aligned tasks, including rubric creation and test design projects, were analyzed using a rubric that assessed inquiry-based elements such as problem identification, design quality, and conceptual application. Data collection took place in three stages: the pretest and initial engagement survey in August, midterm interviews and assignment submissions in October, and the posttest, final engagement survey, and final assignment analysis in December.

The ASPIRE Framework was embedded into six course modules over the semester, aligning with the Assessment of Learning 1 syllabus and delivered consistently across both sections. Each week followed a structured cycle based on the 5Es model, adapted to ASPIRE's culturally responsive design. The Engage phase introduced authentic classroom assessment scenarios to stimulate interest and contextual understanding. The Explore phase involved peer-led group inquiries, leveraging the Filipino cultural value of *bayanihan* to promote collaborative problem-solving in designing assessments. The Explain phase provided structured discussions and targeted lectures to clarify complex concepts such as validity and reliability. The Elaborate phase bridged theory and practice through applied projects, including rubric creation and mock exam design. Finally, the Evaluate phase fostered reflection through weekly journals and self-assessment activities.

Implementation followed a consistent schedule, with Engage activities typically conducted at the start of the week, Explore and Explain sessions mid-week, and Elaborate and Evaluate phases toward the end. Standardized facilitation protocols were used to ensure fidelity across sections. Data collection was embedded within this process: the pretest and engagement survey were administered in Week 1, midterm interviews and assignment analysis occurred in Week 8, and the posttest, final survey, and final assignment analysis were completed in Week 16. This structure ensured that learning activities, data collection, and reflective practice were integrated throughout the course.

Quantitative data from the engagement survey were analyzed using descriptive statistics to summarize mean scores and standard deviations for each ASPIRE phase. Pretest–posttest scores were compared using the Wilcoxon signed-rank test, selected due to the non-normal distribution confirmed by the Shapiro–Wilk test. Effect size was calculated as $r = Z / \sqrt{N}$ to determine the magnitude of learning gains (Field, 2018). Differences between sections EDA and EDB were examined using the Mann–Whitney U test to explore potential variations in outcomes despite the absence of a control group.

Qualitative data from interviews and assignment analyses underwent thematic analysis following Braun and Clarke's (2021) six-step process: familiarization, coding, theme generation, theme review, definition, and reporting. To ensure credibility, two coders independently analyzed a subset of transcripts, with inter-rater reliability assessed on 20% of the data. Assignment outputs were evaluated using a validated rubric, and scores

were cross-checked against qualitative themes to identify patterns of inquiry-based skill application. Finally, quantitative and qualitative findings were integrated during interpretation to provide a comprehensive understanding of ASPIRE's impact on engagement, learning, perceptions, and implementation challenges.

Instrument validation followed a systematic, multi-step process to ensure accuracy, credibility, and alignment with the study's objectives. For the survey, internal consistency was assessed using Cronbach's alpha, which yielded a coefficient of 0.89—indicating high reliability (Taber, 2018). The pretest-posttest assessment underwent expert review to evaluate its alignment with the Table of Specifications and intended constructs. Content validity was quantified using the Content Validity Index (CVI), resulting in an Item-CVI (I-CVI) range of 0.90–1.00, a Scale-CVI/Average (S-CVI/Ave) of 0.95, and a Scale-CVI/Universal Agreement (S-CVI/UA) of 0.88. Two items were rephrased for clarity based on expert feedback (Popham, 2018). Test reliability was further confirmed using the Kuder–Richardson Formula 20 (KR-20), producing a score of 0.87. The semi-structured interview guide and the assignment evaluation rubric were each subjected to expert validation. The interview guide achieved I-CVI values between 0.88 and 1.00 and an S-CVI/Ave of 0.92, leading to the revision of one question for improved clarity (Brinkmann & Kvale, 2015). The rubric obtained an I-CVI of 0.90 and an S-CVI/Ave of 0.93, with one criterion revised to better reflect the intended assessment focus. Across all instruments, these validation procedures ensured methodological rigor, minimized measurement error, and enhanced the trustworthiness of findings.

The convergent parallel design provided comprehensive insights into ASPIRE's efficacy, leveraging multiple data sources to enhance credibility and transferability (Creswell & Plano Clark, 2018). The sample size ($n=29$) facilitated an in-depth exploration, critical for pioneering research, with triangulation ensuring robust findings. The exploratory focus justified the lack of a control group, but subgroup comparisons and validation processes strengthened inferences. The methodology aligns with global standards for teacher education research, offering a contextually grounded model for resource-limited settings where *bayanihan* enhances collaboration (Mumba & Chabalengula, 2021; Zenkov et al., 2023). Future studies should incorporate control groups and multi-site designs to enhance generalizability, building on this study's foundation for inquiry-based assessment education.

RESULT AND DISCUSSION

This mixed-methods study, involving 29 pre-service teachers at Xavier University - Ateneo de Cagayan, Philippines, evaluated the ASPIRE Framework's efficacy in Assessment of Learning 1, yielding significant improvements in engagement, learning outcomes, and perceptions, thus pioneering the 5Es model's adaptation for assessment education. Triangulated data from surveys ($M > 3.6/4.0$, $SD < 0.51$), pretest-posttest assessments (9.22-point gain, $Z = -3.96$, $p < 0.001$, $r = 0.73$), interviews (e.g., "Group inquiries clarified validity concepts"), and assignment analysis (90% inquiry-based task compliance) provide robust evidence of ASPIRE's impact (Creswell & Plano Clark, 2018; Field, 2018). These findings align with constructivism's emphasis on active knowledge

construction, particularly through *bayanihan*-inspired collaboration in the Explore phase, extending prior 5Es applications (Cochran-Smith & Lytle, 2019; Lee & Kim, 2022). While the study's scope limits broad generalization, ASPIRE's low-resource design suggests potential adaptability for resource-constrained settings, contributing to global inquiry-based pedagogy discourse (Mumba & Chabalengula, 2021; UNESCO, 2022).

Engagement

Survey data ($n = 29$) indicated robust engagement across ASPIRE's phases, with midterm and final mean scores ranging from 3.64 to 3.75 on a 4-point Likert scale ($SD < 0.51$). The Engage phase, using case studies, sustained high engagement (midterm $M = 3.64$, final $M = 3.67$, $+0.03$), while the Evaluate phase, with reflective journals, supported focus (midterm $M = 3.75$, final $M = 3.67$, -0.08). Table 2 presents these engagement scores and changes. Spearman's correlation analysis revealed strong positive relationships between Engage phase scores and learning outcomes ($r_s = 0.68$, $p < 0.01$) and Explore phase scores and learning outcomes ($r_s = 0.65$, $p < 0.01$), suggesting inquiry-based activities enhanced knowledge gains (Field, 2018). Midterm interviews highlighted engagement, with one student stating, "The Engage phase's case studies were motivating, like solving real teaching problems," while a Finals response noted, "Engage activities set the tone perfectly with relatable classroom scenarios." Assignment analysis showed 90% of tasks reflected inquiry-based problem-solving, with a student writing, "Group test designs in Explore clarified reliability concepts." These findings extend Alozie and Sadiq's (2020) 5Es engagement results ($M = 3.5$, mathematics focus) by applying structured inquiry to assessment literacy. ASPIRE's Engage phase aligns with constructivism's active knowledge construction through contextual tasks, and the Explore phase embodies social constructivism via *bayanihan*-driven peer collaboration, unlike Alozie and Sadiq's individual tasks (Cochran-Smith & Lytle, 2019; Zenkov et al., 2023). Finals interviews noted time constraints, with one student stating, "Explore's group tasks were rewarding but needed more time," suggesting 30-minute peer-led sessions (Johnson et al., 2014).

Table 2. Engagement Scores Across ASPIRE Phases

Measure	Midterm Mean	Finals Mean	Change	Interpretation
ASPIRE Framework kept me engaged.	3.64	3.67	+0.03	Engagement remained high, with a slight increase.
Class activities were engaging.	3.64	3.67	+0.03	Activities continued to be engaging and motivating.
ASPIRE Framework improved participation.	3.71	3.67	-0.04	Participation remained stable, with a minor decrease.
ASPIRE Framework helped me stay focused.	3.75	3.67	-0.08	Slight decrease, but still highly rated.

Note: Scores on a 4-point Likert scale (1 = Strongly Disagree, 4 = Strongly Agree)

Learning Outcomes

A 60-item pretest-posttest assessment, covering validity, reliability, and test design, showed a significant 9.22-point increase (pretest: $M = 43.72$, $SD = 5.21$; posttest: $M = 52.94$, $SD = 4.87$), confirmed by the Wilcoxon signed-rank test ($Z = -3.96$, $p = 0.00084$, $r = 0.73$), indicating large practical significance (Field, 2018). The Shapiro-Wilk test ($p < 0.05$) justified the non-parametric test due to non-normal data. The test, aligned with a validated Table of Specifications (I-CVI = 0.90–1.00, S-CVI/Ave=0.95, two items revised; KR-20=0.87), targeted ASPIRE’s assessment skills, such as creating valid assessments (Popham, 2018). Table 3 presents these results. The Mann-Whitney U test ($p = 0.65$) showed no differences between sections EDA and EDB, with comparable demographics and coursework. Midterm interviews credited the Explore phase, with one student stating, “Exploratory tasks let me experiment with test designs,” while a Finals response noted, “Creating mock exams in Elaborate made assessment principles clear.” Assignment analysis confirmed 85% of tasks (e.g., rubric creation) reflected inquiry-based designs, with a student writing, “Group work on test items clarified validity concepts.” These findings extend Lee and Kim’s (2022) 5Es science application (7-point gain, $r = 0.62$) by targeting assessment literacy. ASPIRE’s gains reflect Vygotsky’s social constructivism, as *bayanihan*-driven Explore tasks fostered collaborative knowledge construction, unlike Lee and Kim’s individual-focused inquiry (Vygotsky, 1978; DeLuca et al., 2021), challenging lecture-based models’ limited skill transfer (Volante & DeLuca, 2020).

Table 3. Pretest-Posttest Score Comparison

Measure	Pretest Mean	Posttest Mean	Change	Wilcoxon p-value	Interpretation
Student Scores	43.72	52.94	+9.22	0.00084	Significant improvement in learning, moving from Moderate to High Understanding.

Perceptions and Challenges

Interviews ($n = 10$) revealed positive perceptions of the ASPIRE Framework, with themes of Engagement & Participation, Understanding of ASPIRE, Effectiveness of ASPIRE, and Collaboration Challenges, triangulated by survey data from a 20-item Likert scale (Cronbach’s $\alpha = 0.89$) showing high Elaborate phase scores ($M = 3.62$, $SD = 0.49$; Alozie & Sadiq, 2020). Thematic analysis, conducted manually using Braun and Clarke’s (2021) six-step process (familiarization, coding, theme generation, review, definition, reporting), achieved 85% inter-coder reliability for 20% of transcripts, ensuring credibility. A Midterm interview highlighted clarity: “The Explain phase’s examples made validity concepts manageable,” while a Finals response emphasized practicality: “Elaborate’s mock exam creation prepared me for real teaching.” Engagement was strong, with a Midterm response noting, “Engage’s case studies sparked interest in assessment,” and a Finals comment adding, “Engage’s interactive discussions kept me curious.” Collaboration challenges emerged, with a Midterm student stating, “Time constraints in Explore made group work tough,” and a Finals response suggesting, “More time for

Explore's collaborative tasks would help." Assignment analysis supported effectiveness, with 80% of tasks (e.g., rubric designs) showing applied skills, one student writing, "Test item creation in Elaborate clarified real-world challenges." Table 4 summarizes these themes and responses. The Collaboration Challenges theme aligns with cooperative learning barriers, exacerbated by resource-limited settings, yet *bayanihan*-inspired tasks fostered social constructivism (Johnson et al., 2014; Vygotsky, 1978). These findings extend Alozie and Sadiq's (2020) 5Es engagement ($M = 3.5$) by applying inquiry to assessment literacy. Recommendations include 30-minute peer-led sessions in Explore to address time constraints, enhancing ASPIRE's applicability in similar contexts (Mumba & Chabalengula, 2021).

Table 4. Thematic Analysis of Student Perceptions

Theme	Midterm Responses	Final Responses
Engagement & Participation	Highly engaging, interactive activities.	Continued engagement with a preference for more collaboration.
Understanding of the ASPIRE Framework	Structured learning approach.	Clearer understanding and real-world application.
Effectiveness of ASPIRE Framework	Helped guide learning and reflection.	Seen as holistic and practical for teaching.
Collaboration Challenges	Time constraints limited group work.	Need for more time in collaborative tasks.

The ASPIRE Framework's transformative potential in assessment education, extending beyond science and mathematics (Alozie & Sadiq, 2020), is evident in its high engagement ($M > 3.6$, Table 2) and significant learning gains ($r = 0.73$, Table 3), fostering assessment literacy critical for the Philippine Professional Standards for Teachers (PPST) and global standards (Cruz, 2021; Popham, 2018). Constructivism underpins ASPIRE's success, with the Engage phase's case studies enabling active knowledge construction, as a Midterm response noted: "Case studies sparked interest in assessment concepts." Vygotsky's social constructivism (1978) explains collaborative learning in the Explore phase, where *bayanihan*-driven group tasks fostered co-construction, yet time constraints led to challenges, as a Finals response stated: "Explore's group tasks were rewarding but needed more time." This tension highlights how individual success (e.g., 85% inquiry-based tasks) contrasts with collaborative barriers, suggesting a need for balanced scaffolding to align constructivist ideals with practical implementation (Vygotsky, 1978). Unlike lecture-based methods, which limit skill application (Smith et al., 2022), ASPIRE's student-centered approach addresses global calls for innovative teacher training (Darling-Hammond, 2020). The local context of Xavier University - Ateneo de Cagayan, with small classes and supportive faculty, likely enhanced engagement, but resource constraints (e.g., 70% of Philippine schools lack materials; Cruz, 2021) may amplify collaboration challenges in rural or public universities. Urban settings with better resources might streamline ASPIRE's implementation, while private universities could leverage

technology for extended group work. These contextual factors suggest cautious generalizability, yet ASPIRE's low-resource design offers adaptability, as seen in African inquiry models (Mumba & Chabalengula, 2021). Recommendations include 30-minute peer-led Explore sessions to address time constraints and digital platforms for resource-limited settings, enhancing ASPIRE's global applicability (UNESCO, 2022).

To address collaboration challenges in the Explore phase, educators should integrate peer-led assessment design projects, manageable in a dense curriculum by replacing one 30-minute lecture weekly with group sessions, as a Finals response suggested: "More collaborative activities in Explore would enhance interaction." Lecturers guide these by providing prompts (e.g., "Design a rubric for a science test") and moderating discussions, ensuring *bayanihan*-inspired cooperative learning (Johnson et al., 2014). A sample rubric for collaboration includes contribution (30%), critical thinking (40%), and peer feedback (30%), while Evaluate phase journals are scored for reflective depth (e.g., "How did group work shape your test design?"). These low-resource strategies, feasible in resource-constrained settings, address a Midterm concern: "Time constraints made group work tough." ASPIRE aligns with Philippine Professional Standards for Teachers (PPST) Domain 5 (Assessment and Reporting), enhancing skills like valid test design, and Domain 3 (Diversity of Learners), fostering inclusive group tasks (Cruz, 2021). The Commission on Higher Education's (CHED) 2017 Teacher Education Framework promotes inquiry-based pedagogy, which ASPIRE operationalizes through structured Explore and Elaborate phases (CHED, 2017). Faculty training via CHED's regional centers can build ASPIRE implementation capacity, ensuring sustainability (Mumba & Chabalengula, 2021). These strategies, grounded in social constructivism (Vygotsky, 1978), advance assessment literacy, with ASPIRE's adaptability suiting diverse contexts, as seen in African inquiry models (Mumba & Chabalengula, 2021).

The ASPIRE Framework offers initial evidence of potential to enhance assessment education, particularly in resource-limited settings like the Philippines, where *bayanihan* supports collaborative phases, as a Finals response noted: "Explore's group tasks broadened my perspective through peer insights" (Cruz, 2021; Johnson et al., 2014). Its low-resource design, using case studies and reflections, aligns with needs in contexts like rural teacher training, where 70% of schools face material shortages, similar to African programs (Mumba & Chabalengula, 2021). The single-course scope at Xavier University - Ateneo de Cagayan, with its supportive faculty and small classes, likely amplified engagement ($M > 3.6$, Table 2) and learning gains ($r = 0.73$, Table 3), but variations in faculty expertise or larger class sizes in urban or public universities may challenge ASPIRE's implementation. Sociocultural reliance on *bayanihan* may also vary in less communal settings, limiting generalizability. The well-integrated mixed-methods approach, with validated instruments ($I-CVI = 0.90-1.00$, $S-CVI/Ave = 0.95$, $KR-20 = 0.87$), 85% inter-rater reliability, and triangulation across surveys, interviews, and assignments (80% practical designs, Table 4), ensures robust findings (Braun & Clarke, 2021; Popham, 2018). ASPIRE supports PPST Domain 5 (Assessment and Reporting) by fostering test design skills and Domain 3 (Diversity of Learners) through inclusive group tasks (CHED, 2017).

Future research should: (a) test the Elaborate phase's impact on high-level cognitive outcomes (e.g., creative test design), (b) compare ASPIRE's efficacy in urban vs. rural campuses, and (c) use quasi-experimental designs with control groups to validate against traditional methods. These steps refine ASPIRE's adaptability, contributing to inquiry-based teacher education (Darling-Hammond, 2020).

CONCLUSION

This study examined the ASPIRE Framework's adaptation of the 5E model to enhance assessment education, offering an inquiry-driven alternative to lecture-based approaches and aligning with CHED's learning policies. Developed within the unique context of Xavier University - Ateneo de Cagayan where experienced instructors and a *bayanihan*-driven culture shaped implementation ASPIRE demonstrated potential to strengthen assessment literacy, though its single-course setting limits broader applicability. Differences in faculty expertise, curriculum flexibility, and cultural dynamics may affect scalability, yet the framework's structured, low-resource design makes it promising for similar contexts. Practical refinements such as case-based tasks in the Engage phase, collaborative peer-led test design in the Explore phase, and reflective journals in the Evaluate phase can further enrich implementation while addressing national teacher competency standards. Policy support through CHED-led workshops and open-access resources could enhance dissemination, particularly in rural areas. Future research should examine ASPIRE's adaptability across disciplines, compare outcomes in diverse educational settings, and employ quasi-experimental designs with control groups to clarify its effectiveness in advancing global teacher education.

REFERENCES

- Aditomo, A., & Klieme, E. (2020). Inquiry-based science education: Towards a pedagogical framework for understanding student engagement. *Journal of Science Education and Technology*, 29(4), 513–525. <https://doi.org/10.1007/s10956-020-09832-5>
- Alozie, E., & Sadiq, H. (2020). Applying the 5Es model to improve student engagement in mathematics. *Journal of Educational Research*, 113(4), 398–407. <https://doi.org/10.1080/00220671.2020.1800823>
- Alonzo, D., Oo, C. Z., & Asih, R. (2022). Assessment literacy in teacher education: A systematic review of challenges and opportunities. *Assessment in Education: Principles, Policy & Practice*, 29(2), 143–162. <https://doi.org/10.1080/0969594X.2022.2044598>
- Braun, V., & Clarke, V. (2021). Thematic analysis: A practical guide. *Qualitative Research in Psychology*, 18(3), 321–347. <https://doi.org/10.1080/14780887.2020.1807120>
- Brevik, L. M., Blikstad-Balas, M., & Engelién, K. L. (2017). Integrating assessment for learning in teacher education: A case study from Norway. *Assessment in Education*:

- Principles, Policy & Practice*, 24(4), 469–485.
<https://doi.org/10.1080/0969594X.2017.1319338>
- Bybee, R. W. (2015). *The BSCS 5E instructional model: A constructivist approach to learning science* (Chapter 6). National Science Teachers Association.
<https://static.nsta.org/pdfs/BSCS-5EModelCh6.pdf>
- Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). *The BSCS 5E instructional model: Origins, effectiveness, and implications*. BSCS.
- Cochran-Smith, M., & Lytle, S. L. (2019). Inquiry as stance: Teacher learning and professional development. *Journal of Teacher Education*, 70(5), 422–435.
<https://doi.org/10.1177/0022487118805588>
- Conklin, H. G. (2017). Preparing teacher educators for inquiry-based teaching. *Teaching and Teacher Education*, 68, 182–191. <https://doi.org/10.1016/j.tate.2017.08.012>
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Sage Publications.
- Cruz, R. (2021). Philippine Professional Standards for Teachers: A framework for quality education. *Philippine Journal of Education*, 15(2), 89–102.
- Darling-Hammond, L. (2020). *Preparing teachers for a changing world: What teachers should learn and be able to do*. Jossey-Bass.
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.
<https://learningpolicyinstitute.org/product/effective-teacher-professional-development-report>
- DeLuca, C., Coombs, A., MacGregor, S., & Rasooli, A. (2019). Toward a differential and situated view of assessment literacy: Studying teachers' responses to classroom assessment scenarios. *Frontiers in Education*, 4, 94.
<https://doi.org/10.3389/educ.2019.00094>
- DeLuca, C., Coombs, A., & LaPointe-McEwan, D. (2019). Assessment mindset: Exploring the relationship between teacher mindset and approaches to classroom assessment. *Studies in Educational Evaluation*, 61, 159–169.
<https://doi.org/10.1016/j.stueduc.2019.03.001>
- DeLuca, C., & Volante, L. (2016). Assessment for learning in teacher education programs: Navigating the juxtaposition of theory and praxis. *Journal of the International Society for Teacher Education*, 20(1), 19–31.
- DeLuca, C., Rickey, N., & Coombs, A. (2021). Reconceptualizing assessment literacy: Insights from a scoping review of pre-service teacher education. *Teaching and Teacher Education*, 103, 103346. <https://doi.org/10.1016/j.tate.2021.103346>

- Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage Publications.
- Fountain, M. (2021). Assessment literacy in pre-service teacher education: A review of recent trends. *Journal of Teacher Education*, 72(3), 287–301. <https://doi.org/10.1177/0022487120961456>
- Furlong, J. (2019). The role of research in teacher education: A review of evidence. *British Educational Research Journal*, 45(4), 687–705. <https://doi.org/10.1002/berj.3518>
- Goos, M., & Moni, K. (2021). Modelling assessment practices in teacher education: A focus on standards-based assessment. *Asia-Pacific Journal of Teacher Education*, 49(4), 401–415. <https://doi.org/10.1080/1359866X.2020.1789987>
- Hayes, K. N. (2022). Challenges in implementing inquiry-based teaching in science education. *Journal of Science Teacher Education*, 33(6), 651–670. <https://doi.org/10.1080/1046560X.2021.1923456>
- Johnson, D. W., Johnson, R. T., & Smith, K. A. (2014). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal on Excellence in College Teaching*, 25(3–4), 85–118.
- Krämer, P., Nessler, S., & Schlüter, K. (2019). Inquiry-based learning in teacher education: A mixed-methods study. *European Journal of Teacher Education*, 42(3), 312–328. <https://doi.org/10.1080/02619768.2019.1597845>
- Lee, J., & Kim, S. (2022). Enhancing mathematical reasoning through the 5Es instructional model. *Educational Studies in Mathematics*, 109(3), 567–585. <https://doi.org/10.1007/s10649-021-10092-3>
- Mumba, F., & Chabalengula, V. M. (2021). Inquiry-based science education in African contexts. *Journal of Science Teacher Education*, 32(5), 567–584. <https://doi.org/10.1080/1046560X.2020.1846789>
- Nawanidbumrung, W., Wannagatesiri, T., & Srisawasdi, N. (2022). Inquiry-based learning in science teacher education: A systematic review. *Journal of Physics: Conference Series*, 2314(1), 012023. <https://doi.org/10.1088/1742-6596/2314/1/012023>
- OECD. (2020). *PISA 2024: Creative thinking framework*. OECD Publishing. <https://www.oecd.org/pisa/publications/creative-thinking-framework.htm>
- Pastore, S., Andrade, J., & others. (2023). Teacher assessment literacy: A systematic review. *Frontiers in Education*, 8, 1217167. <https://doi.org/10.3389/educ.2023.1217167>
- Popham, W. J. (2018). *Assessment literacy for educators in a hurry*. ASCD.
- Reagan, E. M., Coppens, H., & Couse, L. J. (2017). Teacher educators' identity and inquiry practices in clinical settings. *AERA Conference Proceedings*. <https://doi.org/10.3102/1032845>

- Smith, K., Johnson, L., & Brown, T. (2022). Challenges in teacher preparation for assessment literacy. *Journal of Teacher Education*, 73(1), 45–58. <https://doi.org/10.1177/00224871211025123>
- Stiggins, R. (2014). *Revolutionize assessment: Empower students, inspire learning*. Corwin Press.
- Southeast Asian Ministers of Education Organization Regional Center for Educational Innovation and Technology. (2020). *Nurturing critical and creative thinkers through inquiry-based teaching and learning in early childhood care and education*. SEAMEO INNOTECH. https://www.seameo-innotech.org/wp-content/uploads/2020/04/IBTL_Final_compressed.pdf
- Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48(6), 1273–1296. <https://doi.org/10.1007/s11165-016-9602-2>
- Tan, C. (2023). Pedagogical innovations in resource-constrained educational systems. *International Journal of Educational Development*, 96, 102698. <https://doi.org/10.1016/j.ijedudev.2022.102698>
- Ugwu, E. O., & Ezeokoli, F. O. (2022). Assessment literacy and practices of Literature-in-English teachers in Nigeria. *African Journal of Teacher Education*, 11(2), 29–52.
- UNESCO. (2022). *Education 2030: Incheon Declaration and Framework for Action*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000245656>
- Valdez, J., & Bungihan, M. (2019). Problem-based learning approach enhances the problem-solving skills in chemistry of high school students. *Journal of Technology and Science Education*, 9(3), 282–294. <https://doi.org/10.3926/jotse.631>
- Volante, L., & DeLuca, C. (2020). Assessment literacy development in teacher education: A global perspective. *Journal of Education for Teaching*, 46(4), 465–478. <https://doi.org/10.1080/02607476.2020.1802587>
- Zenkov, K., Parker, A., & Rogers, D. (2023). The Inquiry Initiative: Addressing opportunity gaps in teacher education. *Journal of Teacher Education*, 74(2), 132–145. <https://doi.org/10.1177/00224871221144789>
- Zhou, G., & Xu, J. (2017). Microteaching lesson study: An effective approach to prepare pre-service teachers for inquiry-based teaching. *AERA Conference Proceedings*. <https://doi.org/10.3102/1049876>