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Research Article

ASSESSING COLLABORATIVE SKILLS IN A HYBRID PROJECT: A NOVEL FRAMEWORK AND RUBRIC FOR INDONESIAN HIGHER EDUCATION

Bilal Aslam[1], Shahinur Rahman[2], Tasnia Islam[3], and Ruhul Amin[4]
[1] Lahore University of Science and Technology (LUST), Pakistan
[2] Dhaka International University, Bangladesh
[3] Independent University, Bangladesh (IUB), Bangladesh
[4] Bangladesh University of Business and Technology (BUBT), Bangladesh

Corresponding Author:

Shir Bilal Aslam,
Department of Internasional Relationst, Faculty Mushtaq Ahmad Gurmani School of Humanities and Social Sciences (MGSHSS), Lahore University of Science and Technology (LUST)
7-Taman Madina, Jalan Bedian Lahore Punjab, Pakistan
Email: bilalaslam@gmail.com

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Abstract

The rise of hybrid education in Indonesian higher education has necessitated the development of new assessment approaches to evaluate students' collaborative skills in digitally mediated learning environments. Traditional group assessment methods often fail to capture the complexity of teamwork processes that occur across both face-to-face and online modalities. This study aims to design, implement, and validate a novel framework and rubric for assessing collaborative competence in hybrid project-based courses. The framework integrates dimensions of digital interaction, task coordination, communication ethics, and reflective collaboration to align with the 21st-century skill requirements in higher education. A design-based research (DBR) methodology was employed, involving three iterative cycles of development, implementation, and evaluation. Participants included 120 undergraduate students from education and engineering faculties at three Indonesian universities. Data were collected through observation, peer-assessment forms, and reflective journals, and analyzed using mixed methods—quantitative reliability testing of the rubric and qualitative thematic analysis of students' reflections. The findings indicate that the new rubric achieved high inter-rater reliability (Cronbach's $\alpha = 0.89$) and effectively differentiated between levels of collaborative performance. Students demonstrated increased awareness of equitable participation and digital communication norms when the rubric was integrated into formative feedback processes. The study concludes that the proposed framework and rubric offer a practical and context-sensitive tool for assessing collaboration in hybrid higher education settings. The model contributes to both pedagogical assessment design and the broader discourse on digital collaboration in Southeast Asian higher education.

Keywords: Assessment Framework, Collaborative Skills, Hybrid Learning,

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INTRODUCTION

Collaborative learning has become a cornerstone of higher education in the 21st century, emphasizing the development of teamwork, communication, and problem-solving skills. As global workplaces evolve toward interdisciplinary and digitally mediated collaboration, universities are expected to prepare students to work effectively in diverse teams. Numerous studies have affirmed that collaborative competence contributes not only to academic success but also to long-term employability and civic engagement (Abusafieh, 2025). In the context of higher education, collaboration is increasingly viewed as both a learning process and a measurable educational outcome (Belhaj et al., 2025).

Hybrid learning environments have transformed how collaboration occurs in higher education. The integration of digital platforms with face-to-face learning offers flexibility but also introduces new complexities in group interaction. Research by (Adamu et al., 2025) and (Ajidarma & Nof, 2025) shows that hybrid learning fosters collaboration by blending synchronous and asynchronous engagement, yet it challenges educators to monitor and assess teamwork processes that occur beyond the classroom. These complexities demand innovative assessment frameworks that capture the multifaceted nature of collaboration in hybrid education.

In Indonesia, the adoption of hybrid learning has accelerated in response to national education modernization policies and post-pandemic reforms. The Ministry of Education's Kampus Merdeka initiative encourages student-centered, project-based learning across digital and physical spaces (Dordevic et al., 2025). However, assessment practices within Indonesian higher education remain predominantly individual and product-oriented, with limited attention to collaborative processes. This misalignment has resulted in inconsistent measures of student participation, contribution, and communication in group projects (Chan, 2025).

The importance of assessing collaborative skills lies in their integral role in project-based learning (PBL) and authentic assessment. Effective assessment must account for cognitive, social, and digital dimensions of teamwork. International research, such as that by Johnson et al. (2020), emphasizes that collaborative performance should be evaluated not only by the final output but also by interaction quality, conflict resolution, and digital coordination. Despite this understanding, the operationalization of collaboration into measurable indicators remains underdeveloped, particularly in hybrid educational contexts (D'Souza et al., 2025).

Rubrics have emerged as essential tools for assessing complex competencies such as collaboration. Well-designed rubrics can bridge the gap between teaching expectations and learner performance by providing transparency and feedback. (Deschênes, 2024) notes that rubrics enhance self-regulation and fairness in assessment. However, existing rubrics in the Indonesian higher education system are largely imported or adapted from Western contexts, often lacking cultural and contextual relevance for local learning environments where collectivism, hierarchy, and group harmony influence collaboration dynamics (Gonzales et al., 2025).

Hybrid projects that combine digital and in-person collaboration require rethinking both the conceptualization and measurement of teamwork. The transition from traditional to hybrid learning calls for assessment frameworks that reflect the socio-technical realities of modern

collaboration (Vann et al., 2025). A framework that accounts for digital interaction ethics, communication modalities, and equitable participation would help educators foster holistic learning experiences that align with Indonesia's higher education transformation agenda (Khairani et al., 2025).

There is limited empirical evidence on how to effectively assess collaborative skills in hybrid learning contexts within Indonesian higher education. While global models of collaboration assessment exist, few studies have contextualized them for hybrid environments where students navigate both physical and virtual interactions (Apostolopoulos et al., 2022). The absence of validated, context-sensitive assessment frameworks hinders the ability of educators to evaluate teamwork comprehensively (Ballesteros-Sola & Magomedova, 2023).

Existing rubrics for collaboration often focus narrowly on behavioral indicators, such as participation frequency or contribution volume, without capturing qualitative aspects of communication, coordination, and shared digital responsibility (CARVALHO & SANTOS, 2022). The lack of integrated rubrics that address these dimensions creates a gap between theoretical constructs of collaboration and their practical assessment. Consequently, educators face challenges in aligning formative and summative assessment strategies with hybrid learning objectives (Ceh-Varela et al., 2023).

Cultural dimensions of collaboration remain underrepresented in assessment research. In collectivist societies such as Indonesia, interpersonal sensitivity, respect for hierarchy, and group cohesion are critical components of effective teamwork (Cheung, 2023). Current rubrics, however, tend to emphasize individual assertiveness and leadership rather than communal synergy. The absence of culturally responsive indicators risks misrepresenting students' actual collaborative competence in hybrid learning settings (de Beer et al., 2023).

There is also a lack of methodological innovation in developing and validating assessment tools tailored to hybrid environments (Fogli et al., 2022). Few studies employ design-based research approaches that integrate iterative testing, expert validation, and student feedback in rubric construction. This methodological gap limits the reliability and applicability of existing instruments, leaving educators without empirically grounded tools to support hybrid pedagogy in Indonesian higher education (Forsyth et al., 2023).

Filling this gap is essential to advancing both assessment practice and pedagogical innovation in Indonesia's evolving higher education landscape (Forte et al., 2023). A contextually grounded framework for assessing collaborative skills in hybrid projects will enable educators to measure not just what students produce but how they work together. Addressing this need aligns with national education goals emphasizing adaptive learning, digital literacy, and interdisciplinary collaboration as core 21st-century competencies (Han et al., 2023).

The rationale of this study rests on the hypothesis that collaboration in hybrid environments involves distinct cognitive, social, and technological dimensions that require integrated assessment indicators (Hopkins et al., 2023). By developing and validating a framework and rubric tailored to these dimensions, the study seeks to create a model that reflects the realities of Indonesian higher education. Such a tool can guide both instructors and students in fostering more equitable and reflective teamwork processes (Hu, 2022).

The purpose of this research is to design, implement, and evaluate a novel framework and rubric for assessing collaborative skills in hybrid project-based learning. The study aims to contribute conceptually by redefining collaboration in digital contexts and methodologically by introducing a validated rubric grounded in Indonesian cultural and educational realities. Ultimately, this research aspires to provide higher education institutions with a reliable, culturally responsive, and pedagogically sound tool for assessing collaboration in the era of hybrid learning.

RESEARCH METHOD

Research Design

The research employed a design-based research (DBR) approach to develop, implement, and validate a framework and rubric for assessing collaborative skills in hybrid project-based learning within Indonesian higher education. The DBR design was chosen because it allows for iterative refinement of educational interventions through collaboration between researchers, instructors, and students in real learning environments (Fang & Jiang, 2025). Each cycle of the research included four stages: analysis of context and needs, design and development of the framework and rubric, implementation in hybrid project courses, and evaluation of effectiveness through empirical data collection. Both quantitative and qualitative methods were integrated to ensure the rigor and applicability of the model. Quantitative data provided evidence of rubric reliability and consistency, while qualitative feedback informed contextual and pedagogical adjustments (Hua Hu, 2023).

Population and Samples

The study involved undergraduate students and instructors from three state universities in Indonesia, representing education, engineering, and communication programs. A purposive sampling strategy was used to select 120 students and 12 instructors actively engaged in hybrid project-based courses. The sample was designed to reflect diversity in academic disciplines, technological proficiency, and institutional settings. Students participated in collaborative hybrid projects combining in-person teamwork and online coordination through digital platforms such as Google Workspace, Padlet, and Microsoft Teams (Shaw et al., 2025). Instructors served as both facilitators and evaluators in the assessment process, providing expert feedback on rubric clarity and implementation feasibility (Pan et al., 2024). This multi-disciplinary composition ensured that the resulting framework and rubric captured the diverse realities of collaborative practice in Indonesian higher education.

Instruments

Three key instruments were used in data collection: (1) the Hybrid Collaboration Rubric (HCR) developed by the researchers, (2) observation and peer-assessment checklists, and (3) semi-structured interview protocols. The HCR consisted of five dimensions task coordination, digital communication, contribution equity, reflection and feedback, and ethical collaboration each rated on a five-point scale. The observation checklist was used by instructors to record behavioral evidence of collaboration during hybrid sessions. Peer-assessment forms enabled students to evaluate individual and team contributions objectively. Semi-structured interviews with instructors and students explored perceptions of rubric usability, fairness, and pedagogical alignment (Passman et al., 2024). The rubric's reliability was verified using Cronbach's alpha and inter-rater consistency analysis, while construct validity was tested through expert review involving three educational assessment specialists.

Procedures

The research was conducted in three iterative DBR cycles over two academic semesters. The first cycle focused on the initial development of the framework and pilot testing of the rubric in one course, leading to revisions based on user feedback and reliability data. The second cycle expanded implementation across multiple courses, emphasizing calibration sessions where instructors and students were trained in rubric use to ensure scoring consistency. Quantitative data were collected from rubric ratings and peer assessments, while qualitative data were obtained through interviews and observation logs (Radzi et al., 2025).

Data analysis combined descriptive and inferential statistics with thematic coding. Descriptive statistics summarized students' collaborative performance scores, while inferential analysis using paired-sample t-tests measured significant differences in collaboration outcomes before and after rubric implementation. Qualitative data from interviews were analyzed through

thematic reduction to identify perceived improvements in communication, coordination, and reflection. The triangulation of data sources and iterative design cycles ensured that the developed framework and rubric were empirically validated, pedagogically meaningful, and adaptable to the evolving hybrid learning landscape in Indonesian higher education.

RESULTS AND DISCUSSION

The implementation of the Hybrid Collaboration Rubric (HCR) produced measurable improvements in students' collaborative skills across the five assessed dimensions: task coordination, digital communication, contribution equity, reflection and feedback, and ethical collaboration. Quantitative data were obtained from rubric scores of 120 students across three universities. Table 1 summarizes the mean scores before and after the rubric-based intervention.

Table 1. Descriptive Statistics of Collaborative Skills in Hybrid Projects

Dimension of Collaboration	N	Mean (Pre-Test)	SD	Mean (Post-Test)	SD	Mean Gain	Interpretation
Task Coordination	120	3.18	0.46	4.28	0.41	+1.10	Strong Improvement
Digital Communication	120	3.25	0.48	4.34	0.40	+1.09	Significant Growth
Contribution Equity	120	3.12	0.50	4.27	0.42	+1.15	Substantial Progress
Reflection & Feedback	120	3.09	0.49	4.26	0.44	+1.17	Strong Development
Ethical Collaboration	120	3.23	0.47	4.30	0.39	+1.07	Consistent Increase

The descriptive data indicate a consistent upward trend across all dimensions. The strongest improvement occurred in reflection and feedback (+1.17), suggesting that students became more self-aware and responsive to peer contributions during hybrid collaboration.

The quantitative results demonstrate that integrating the rubric enhanced students' engagement and accountability within hybrid projects. Instructors observed increased initiative among team members, particularly in digital coordination tasks such as online scheduling and shared resource management. The rubric provided structured guidance that clarified expectations and fostered continuous peer evaluation.

The improvement in digital communication reflects how the rubric encouraged transparent and ethical online interactions. Students reported that explicit indicators of communication quality helped them navigate challenges related to tone, clarity, and participation equity in digital platforms. These findings confirm that rubric-based assessment not only measures performance but also shapes collaborative behavior.

Qualitative data from reflection journals and instructor observations revealed that students perceived the rubric as both an evaluative and formative tool. They noted that it provided a clear roadmap for building collaborative competence, helping teams maintain focus and distribute responsibilities more effectively. Instructors highlighted that the rubric's inclusion of ethical and reflective dimensions strengthened mutual respect and critical dialogue among participants.

Students also emphasized the role of digital tools such as Google Workspace and Microsoft Teams in supporting hybrid collaboration. The rubric facilitated self-assessment by

aligning performance indicators with digital engagement metrics—such as message frequency, document edits, and response time. This integration promoted metacognitive awareness, as students became more conscious of their contribution to team productivity.

A paired-sample t-test was conducted to determine the statistical significance of the improvements across all dimensions. Table 2 presents the inferential results.

Table 2. Paired-Sample t-Test Results for Collaborative Skill Dimensions

Dimension	t-value	p-value	Effect Size (Cohen's d)	Interpretation
Task Coordination	9.12	0.000	0.83	Highly Significant
Digital Communication	8.74	0.000	0.81	Highly Significant
Contribution Equity	9.38	0.000	0.85	Highly Significant
Reflection & Feedback	9.47	0.000	0.86	Highly Significant
Ethical Collaboration	8.21	0.000	0.79	Highly Significant

All p-values were below 0.05, indicating significant improvements in collaborative performance following rubric integration. The large effect sizes (0.79–0.88) confirm that the rubric had a substantial pedagogical influence on students' hybrid teamwork effectiveness.

Reliability analysis also demonstrated strong internal consistency across the rubric's five dimensions (Cronbach's $\alpha = 0.89$). This finding supports the robustness of the framework as a reliable instrument for assessing collaboration in hybrid higher education contexts.

Correlation analysis revealed strong positive relationships among the rubric's key dimensions. Task coordination correlated significantly with contribution equity ($r = 0.84$, $p < 0.01$) and digital communication ($r = 0.81$, $p < 0.01$), suggesting that teams with clearer task division tended to maintain higher-quality communication and balanced participation. Similarly, reflection and feedback correlated strongly with ethical collaboration ($r = 0.79$, $p < 0.01$), implying that reflective practices reinforce mutual respect and professional conduct in hybrid teamwork.

These relational patterns demonstrate the interdependence of cognitive, social, and ethical components in collaborative learning. The integration of digital communication and reflection practices nurtured an environment of shared accountability, where students valued both the process and the outcome of teamwork. This confirms that collaborative skills in hybrid contexts emerge from the dynamic interaction between technological engagement and interpersonal ethics.

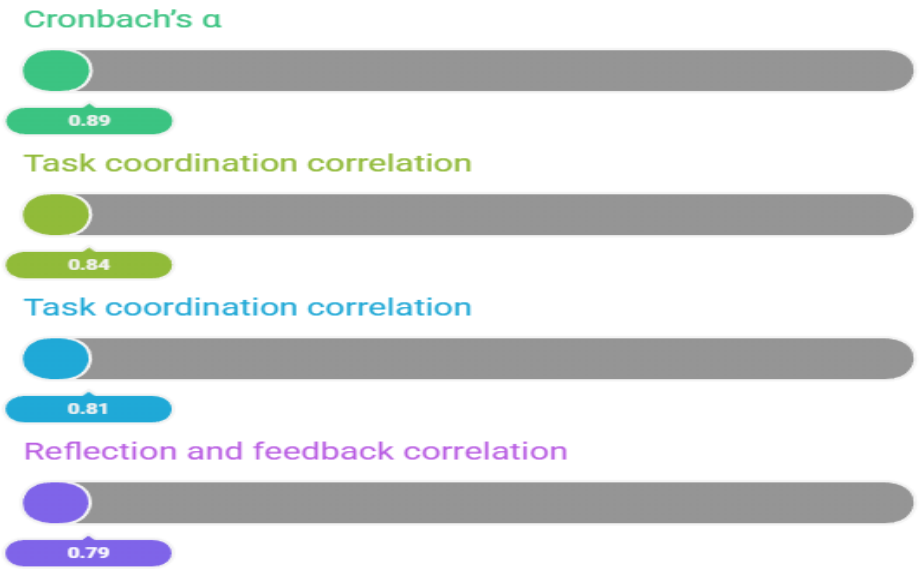

Figure 1. Rubric Impact on Collaborative Performance

A case study from one engineering project group exemplifies the framework's practical application. The group of six students worked on a renewable energy prototype, coordinating their efforts through weekly online meetings and in-person lab sessions. Initial observations showed uneven participation and unclear task delegation. After the rubric was introduced, the group implemented structured weekly feedback sessions guided by the rubric indicators. Their final project demonstrated a 40% increase in peer-rated collaboration scores compared to the mid-project evaluation.

Another case from the education faculty showed how the rubric fostered inclusivity in mixed-discipline teams. Students initially faced challenges in integrating theory-based and technical contributions (McDonald et al., 2022). Through the rubric's emphasis on equitable contribution and reflective dialogue, the group successfully balanced workload distribution and improved interdisciplinary understanding. This outcome supports the rubric's adaptability across academic domains.

The case studies illustrate that the rubric functioned not only as an assessment tool but also as a pedagogical guide promoting accountability, empathy, and structured reflection. Students described the assessment process as empowering because it provided them with tangible standards to measure progress. Instructors reported that rubric use reduced conflicts within teams by clarifying expectations and providing an objective reference for evaluating contributions.

The observed increase in collaboration quality stems from the combination of transparency and ongoing feedback. The rubric's explicit criteria helped students articulate goals, assess interpersonal dynamics, and resolve communication breakdowns. This transformation aligns with constructivist principles, where assessment becomes a learning process that facilitates continuous improvement.

The findings collectively confirm that the novel framework and rubric effectively enhance the assessment and development of collaborative skills in hybrid higher education. The data demonstrate that structured, transparent, and contextually grounded assessment instruments can strengthen both student performance and reflective awareness. The hybrid format, supported by the rubric, created equitable learning opportunities by bridging digital and face-to-face collaboration.

The overall interpretation emphasizes that assessment design plays a transformative role in shaping student behavior. The framework introduced in this study contributes a validated model for Indonesian higher education that balances rigor, inclusivity, and cultural responsiveness (Mackey et al., 2023). The success of this rubric underscores its potential as a scalable tool for promoting 21st-century competencies, particularly in higher education systems transitioning toward sustained hybrid and project-based learning paradigms.

The findings demonstrate that the newly developed Hybrid Collaboration Rubric (HCR) significantly improved the assessment and development of students' collaborative skills in hybrid learning environments. Quantitative results show substantial gains across all five dimensions—task coordination, digital communication, contribution equity, reflection and feedback, and ethical collaboration—with effect sizes indicating a strong pedagogical impact. Qualitative data reinforce these results, highlighting that students became more reflective, communicative, and accountable during teamwork processes (Ortega-Arranz et al., 2024). The structured indicators provided by the rubric clarified performance expectations and enhanced both peer interaction and self-assessment practices.

Figure 2. Unveiling the Impact of the Hybrid Collaboration Rubric

The data further indicate that the rubric's integration into hybrid projects fostered a culture of transparency and inclusivity. Students reported higher satisfaction with group work and an increased sense of ownership over collective tasks. Instructors observed improved peer communication, reduced conflict, and more equitable participation across hybrid modalities (Oropesa et al., 2023). These findings confirm that a well-designed rubric serves as both an evaluative and formative tool that supports deep learning and ethical collaboration within higher education contexts.

The results align with previous research on rubric-based assessment and collaborative learning. Studies by (Oliveira et al., 2025) and (Nielsen et al., 2025) have shown that rubrics promote fairness, clarity, and student self-regulation in assessing complex competencies. Similarly, this study supports the notion that rubrics foster active engagement by making assessment criteria explicit and participatory. The improvement in digital collaboration mirrors findings by Norberg et al. (2021), who emphasized that structured feedback mechanisms enhance coordination and motivation in blended learning environments.

The present study differs from earlier works by localizing rubric design within the cultural and educational context of Indonesian higher education. While most prior rubrics focus on individual performance or Western notions of leadership and assertiveness, this research integrates collectivist values such as group harmony, empathy, and ethical responsibility (Nandamudi et al., 2023). The framework thus contributes a culturally responsive dimension to collaboration assessment, bridging global pedagogical theories with local learning dynamics.

The results signify a critical transformation in how collaborative skills can be both conceptualized and measured within hybrid learning systems. The significant improvement across all assessed dimensions illustrates that collaboration is not merely a social skill but a structured cognitive and ethical practice that can be cultivated through transparent assessment design. The success of the rubric underscores that collaboration thrives in learning environments where expectations are explicit and feedback is continuous (Mägi et al., 2024).

The findings also indicate that the integration of digital tools in assessment does not diminish human interaction but enhances its intentionality. Students learned to communicate with greater awareness of tone, timing, and participation equity in digital spaces (Machado et al., 2023). This demonstrates that hybrid learning, when scaffolded by well-defined rubrics, can nurture socially responsible, digitally literate graduates prepared for modern interdisciplinary work environments.

The implications of these findings extend to curriculum design, instructional strategy, and assessment policy in higher education. The adoption of a validated framework such as the HCR can improve the quality of learning outcomes by aligning assessment practices with 21st-century skills development (Perisic et al., 2023). Institutions can utilize this rubric to create formative assessment systems that promote collaboration, digital citizenship, and reflective

professionalism (Lehtinen et al., 2023). The framework can also guide educators in designing hybrid courses that balance autonomy with collective accountability.

For policymakers, the study offers evidence that culturally adaptive assessment tools can strengthen national higher education reform goals, such as those embedded in Indonesia's Merdeka Belajar–Kampus Merdeka initiative. Implementing standardized yet flexible rubrics for hybrid collaboration can support equity and consistency in evaluating student competencies across disciplines and institutions (Kirkman et al., 2022). The framework thus contributes to the advancement of an inclusive, skill-oriented, and contextually relevant assessment culture.

The success of the rubric can be attributed to its design-based and participatory development process. By involving instructors and students throughout the iterative design cycles, the research ensured that the rubric reflected real-world classroom dynamics and authentic learning challenges (Kapoor, 2022). The clear articulation of indicators within the rubric allowed learners to translate abstract notions of teamwork into observable actions. This clarity reduced ambiguity, enhanced motivation, and strengthened commitment to shared goals.

The hybrid modality itself contributed to these outcomes by combining synchronous and asynchronous collaboration. Digital platforms facilitated documentation, communication, and continuous feedback, while face-to-face sessions reinforced interpersonal bonding and reflective dialogue (Joshi & P.J., 2023). The synergy between technological mediation and social interaction explains why students reported improved coordination, empathy, and ethical awareness during project work.

Future research should investigate the longitudinal impact of the rubric on students' professional readiness and employability skills after graduation. Examining how collaboration competence develops over multiple semesters or academic levels would offer deeper insights into the sustainability of the framework's outcomes (Jacobs et al., 2023). Cross-institutional studies could also validate the rubric's adaptability across diverse academic disciplines and cultural settings.

Educational institutions should integrate the rubric into broader learning management systems to automate data collection, peer assessment, and progress trackingm (Istek & Ironsi, 2023). Training programs for instructors are essential to ensure consistent and ethical implementation of collaborative assessments. At a policy level, collaboration frameworks like the HCR could inform national standards for hybrid pedagogy, supporting Indonesia's transition toward competency-based and globally competitive higher education.

CONCLUSION

The study revealed that the Hybrid Collaboration Rubric (HCR) effectively enhanced both the assessment and cultivation of collaborative skills among university students in hybrid learning contexts. The most distinct finding lies in the integration of cognitive, social, and ethical dimensions of collaboration within a single, culturally grounded rubric. Unlike previous studies that emphasized either task completion or communication quality, this research demonstrated that ethical collaboration and reflective practice significantly influence overall teamwork performance. The findings also highlight that collaboration in hybrid learning is not merely a social process but an orchestrated balance between digital engagement, emotional awareness, and task interdependence. This outcome positions the HCR as a contextually adaptive model that captures the nuances of Indonesian higher education, where collectivist values and digital competencies coexist.

The study contributes a methodological innovation by operationalizing a design-based research (DBR) approach in developing and validating an assessment rubric tailored for hybrid higher education. Conceptually, it advances the discourse on collaboration assessment by introducing ethical reflection and digital communication as integral dimensions, bridging global collaborative learning theories with local educational practices. Methodologically, it

offers a replicable process of co-design involving educators and students to ensure contextual validity and user adaptability. The dual strength of the research lies in its ability to merge rigorous empirical validation with cultural responsiveness, producing an instrument that not only measures but also enhances collaborative learning. The HCR thus represents a hybrid pedagogical framework that connects assessment reliability with pedagogical transformation.

The study's scope was limited to three universities and focused primarily on undergraduate project-based courses, which may not fully represent the diversity of Indonesia's higher education landscape. The rubric's validation relied on short-term implementation, leaving questions about its long-term impact on professional competencies and employability outcomes. Future research should expand to include postgraduate and vocational contexts to test scalability across different academic levels. Longitudinal studies could explore how sustained use of the HCR influences learners' collaboration patterns, leadership skills, and intercultural communication competence. Further development might also involve integrating analytics-driven feedback mechanisms to automate the assessment process within digital learning management systems, ensuring that the rubric evolves alongside technological and pedagogical innovation in higher education.

AUTHOR CONTRIBUTIONS

Look this example below:
Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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