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Design of a Collaborative Learning Platform Based on Problem-Based Learning for Distance Education: A Preliminary Study

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Abstract: This study aims to design and validate an initial concept of a collaborative Problem-Based Learning (PBL)-based learning platform tailored for the context of distance learning. The research employed a descriptive-exploratory design with a mixed-methods approach. Quantitative data were collected through a 5-point Likert scale questionnaire administered to 23 chemistry education students, while qualitative data were obtained from open-ended questions and expert reviews involving four subject matter experts. Quantitative data were analyzed using descriptive statistical techniques, including the calculation of mean scores and reliability testing with Cronbach's Alpha, whereas qualitative data were analyzed through thematic analysis to identify key themes and insights. The results indicate high user demand for integrated features, including scheduled consultations with lecturers (M = 4.52), collaborative group work within a single platform (M = 4.39), direct upload and feedback mechanisms (M = 4.26), activity logs and contribution rubrics (M = 4.21), and online project presentations (M = 4.17). Expert evaluations confirmed the alignment of the proposed design with PBL stages while emphasizing three prerequisites for implementation: (i) an intuitive interface that minimizes user cognitive load, (ii) concise orientation or training sessions for both lecturers and students, and (iii) connectivity mitigation strategies such as low-bandwidth modes and asynchronous alternatives. These findings provide an evidence-based foundation for subsequent prototyping and pilot testing to ensure the platform's effectiveness in enhancing collaboration, process transparency, and learner engagement in distance PBL contexts. The study's outcomes are expected to contribute to the development of innovative learning platforms that support student-centered learning and foster collaborative problem-solving skills in online learning environments.

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Introduction

Problem-Based Learning (PBL) is widely recognized as an effective instructional model for fostering critical thinking, problem-solving skills, and learner autonomy (Asri et al., 2024). In the context of distance education, the need for platforms that support collaborative PBL becomes increasingly urgent, given the limited face-to-face interactions and the necessity for coordinated teamwork among students, which requires integrated digital support (Mühlfelder & Chandrasekaran, 2015). This preliminary study focuses on designing a collaborative PBL platform for distance learning through mapping user needs and preferences, combined with expert feedback, as an evidence-based foundation for further development.

The PBL model emphasizes process over product, beginning with authentic problems, encouraging self-directed inquiry, fostering collaborative work, and culminating in defensible solutions. Conceptually, modern PBL strengthens the role of collaboration as a space for discussion, role distribution, and shared knowledge construction. This necessitates adequate digital infrastructure when learning is conducted online. Prior studies have documented that PBL contributes to increased engagement and learning outcomes when supported by meaningful interaction mechanisms and timely feedback (Yew & Goh, 2016). Therefore, platform design should place collaboration as a core feature, rather than as a mere complement.

Distance education reshapes several aspects of the learning process, including social presence, teaching presence, and cognitive presence, all of which must be fostered through digital media (McKerlich et al., 2011). Previous research has shown that social presence is positively associated with satisfaction, achievement, and persistence in online learning (Richardson et al., 2017). While strong teaching presence correlates with improved learning outcomes (Caskurlu et al., 2020). In collaborative PBL, this means that the platform should facilitate group discussions, provide clear consultation channels with instructors, and maintain well-documented records of team outputs. The Community of Inquiry framework further emphasizes that instructional strategies must be explicitly articulated to ensure interactions remain purposeful and student engagement is sustained throughout the learning process (Fiock, 2020).

The rapid shift to online learning during the pandemic highlighted the significant distinction between “emergency remote teaching” and well-designed online learning (Hodges et al., 2020). Previous research underscores the importance of course design, the instructor’s role, and interaction strategies as determinants of online learning quality (Martin et al., 2020). Consequently, implementing PBL in distance learning requires team coordination similar to conventional settings (Cavicchia et al., 2018). Therefore, the platform should consolidate team workspaces, synchronous and asynchronous communication, venues for presenting team outputs, and feedback mechanisms into a single, integrated ecosystem. Such integration reduces the need for users to switch between multiple separate applications.

A key issue in online collaboration is fairness and transparency of contribution. Without transparency in roles and individual effort, teams are vulnerable to workload imbalances, reduced motivation, and internal conflict (Bower et al., 2017). Previous studies stress the importance of transparent processes and clear assessment practices to promote fairness and engagement (Carless & Boud, 2018). In the context of PBL, this entails having features such as activity logs to record each member’s contribution, shared assessment rubrics, and rapid, clear feedback on team outputs.

Several previous studies have developed online platforms to support problem-based and collaborative learning, but each followed different approaches and left certain gaps. First, some researchers extended existing Learning Management Systems (LMS) such as Moodle or Canvas by adding discussion forums, group spaces, and rubric-based assessments. While these tools helped structure online collaboration, the workflow often remained fragmented and not fully integrated (de Jong et al., 2014);(Rana & Gautam, 2023)(Mikroyannidis et al., 2013). Second, other studies created stand-alone PBL tools that guide learners through structured stages—problem formulation, investigation, synthesis, and presentation. However, these tools rarely provide transparent ways to monitor individual contributions or connect activity logs with team assessment (Schwendimann et al., 2017). Third, recent work has explored analytics-based dashboards that visualize participation and

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feedback to enhance reflection and engagement(Bodily & Verbert, 2017). Although promising, most of these projects were small-scale pilots with limited expert validation during the design phase. In contrast, the present study combines student needs analysis with expert design validation prior to prototyping. It proposes an integrated platform concept that unites collaboration, instructor consultation, contribution transparency, and iterative feedback within a single, coherent environment. This approach directly addresses the fragmentation and lack of pre-development validation that have characterized many earlier platform-development efforts.

The research problem addressed in this study stems from the gap between the collaborative needs of PBL in distance education and the availability of platform features that fully support these processes. Preliminary user surveys across institutions indicate that online learning is often susceptible to feelings of isolation (Xiaodi et al., 2024), dominance of individual assignments, and low interactivity (Paul, 2022). At the same time, strong preferences have emerged for features such as instructor consultation, group work within a single platform, direct upload and feedback on group outputs, transparent activity logs, and spaces for presenting work (Kumar & Sagar, 2022). This preliminary study empirically examines these preferences and challenges to inform the initial design.

Prior research provides both theoretical and empirical foundations for developing a collaborative PBL platform in distance education. Previous studies have confirmed that the quality of online learning experiences is determined by the clarity of interaction design and instructional roles (Razali et al., 2015), while strong social presence correlates with satisfaction and achievement (Richardson et al., 2017). In assessment and feedback practices, the literature emphasizes the importance of feedback literacy, dialogic feedback, and transparent assessment mechanisms to promote deeper learning (Ocampo & Panadero, 2023). In the context of PBL, earlier studies have highlighted that contextual problem relevance, teamwork, and the instructor's role as facilitator are critical to successful learning processes (Yew & Goh, 2016). Collectively, these findings point to the need for a platform that not only delivers learning materials but also integrates collaboration, consultation, presentation of team outputs, and feedback.

The state of the art in this study lies in its integration of user data and expert input prior to full-scale development, ensuring both pedagogical relevance and design validity. Unlike previous studies that primarily examined user perceptions or small-scale usability trials without expert validation (Schwendimann et al., 2017);(Bodily & Verbert, 2017), this research combines student needs analysis with systematic expert review before prototyping. This dual approach enables the proposed design to address both functional and instructional dimensions of collaborative PBL more comprehensively. In the broader context of distance education, current practices highlight the importance of presence, group discussion, and assessment for/as learning, with process records serving as the foundation for feedback and evaluation(Garrison, 2016). Moreover, while earlier works focused mainly on maintaining online continuity during the pandemic, recent studies have emphasized enhancing the quality of the learning experience (Hodges et al., 2020). Responding to these shifts, the collaborative PBL platform design in this study emphasizes three core features: (1) transparency of individual contributions, (2) clear consultation channels with instructors, and (3) a continuous process cycle for uploading outputs, receiving feedback, and presenting work. These features synthesize key insights from previous research while extending them through a validated, integrated design framework.

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The aim of this study is to present preliminary evidence for the design of a collaborative PBL platform in distance education by characterizing user needs and expert recommendations on feature design. Its urgency lies in two aspects: first, to provide a data-driven design foundation that minimizes the risk of a design–use gap during development; and second, to enrich the online PBL literature with a focus on integrating collaboration, consultation, and process transparency features that are often fragmented across multiple separate applications. In the next stage, the findings from this study will guide more systematic expert validation and prototype testing to ensure the design effectively addresses identified collaboration challenges and enhances the quality of the online learning experience.

Research Method

This study employed a descriptive–exploratory survey design with a mixed-methods approach. Quantitative and qualitative data were collected and analyzed to generate insights into the design of a collaborative problem-based learning (PBL) platform for distance education. The respondents consisted of 23 chemistry education students from the Faculty of Teacher Training and Education (FKIP) at Universitas Terbuka, selected through purposive sampling to capture their experiences and perspectives on collaborative, problem-based learning in a distance learning environment. Although the sample size (n = 23) is relatively small for quantitative analysis, it was deemed sufficient for this exploratory study, which aimed to identify design needs and user perceptions rather than to generalize findings. This size also allowed for data saturation in the qualitative responses, ensuring the reliability of emerging themes within the scope of the investigation.

In addition, four experts, two in instructional strategy and two in educational technology, were involved to evaluate the initial design of the proposed platform. Prior to the main data collection, the questionnaire and open-ended items underwent content validation by the experts to ensure the construct relevance, clarity, and alignment with the study objectives. Minor adjustments were made based on their feedback to improve wording and ensure comprehensibility. The final instrument comprised structured questionnaires using a 5-point Likert scale alongside open-ended questions for qualitative elaboration. Table 1 presents the demographic characteristics of the student respondents.

Table 1. Demographic Information Of The Student Respondents

Attribute	Category	Frequency	Percentage
Gender	Male	13	56.5%
	Female	10	43.5%
Age Range	26–30	9	39.0%
	21–25	5	21.7%
	31–35	3	13.3%
	36–40	3	13.3%
	41–45	2	8.6%
	46–50	1	4.3%
Occupation	Teacher	12	60.8%
	Non-Teacher	20	39.2%

In the quantitative analysis, responses were scored on a scale of 1–5, followed by descriptive statistics for each item (mean per item) and composite scores for each indicator (mean of related items). The reliability of the instrument was assessed using Cronbach's alpha, with a threshold value of > 0.60 considered acceptable for reliability(Ghozali, 2016). Based on the analysis, all Cronbach's alpha values exceeded 0.60, indicating that all items in the instrument were reliable.

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Table 2. Cronbach's Alpha Value

Indicator	Cronbach's Alpha
Students' Perspectives and Experiences in Collaborative Learning in Distance Education	0.885
Students' Perspectives and Experiences in Problem-Based Learning	0.755
Needs for an Integrated Collaborative PBL Platform	0.775
Expected Features of the Collaborative PBL Platform	0.779

The obtained scores were then converted into qualitative categories based on the classification shown in Table 2 below.

Table 3. Score Interval

Score Interval	Category
$X > 4.2$	Strongly Agree
$3.4 < X \leq 4.2$	Agree
$2.6 < X \leq 3.4$	Neutral
$1.8 < X \leq 2.6$	Disagree
$X \leq 1.8$	Strongly Disagree

Qualitative data were collected through open-ended questions and focus group discussions (FGDs) with respondents. Qualitative data were analyzed using thematic analysis. The synthesis of results integrated both quantitative findings and qualitative themes to map the platform design features most relevant to the respondents' needs.

Results and Discussion

Result

Students' Perspectives on Collaborative PBL in Distance Education

The initial part of this discussion presents findings on students' perspectives regarding distance learning, collaborative practices, and readiness to engage in PBL, including the perceived need for platform features that support the learning process. The following section summarizes general response trends, the most frequently emerging issues, and their implications for platform design.

Table 4. Students' Perspectives and Experiences in Collaborative Learning during Distance Education

Statement	Mean Score	Category
I feel that current online learning is still too focused on individual assignments and lacks collaborative experience	3.39	Agree
I feel isolated or socially disconnected from peers during distance learning	3.43	Agree
I rarely receive group assignments during distance learning	3.65	Agree
There is no platform specifically designed to facilitate group work in online learning	4.00	Agree
I feel I do not have sufficient opportunities to develop collaborative skills in distance learning	3.30	Neutral
Average	3.56	Agree

These findings are supported by interview statements. One student (A) stated, "*Throughout my studies in the distance learning scheme, I have never received group assignments and have had limited experience collaborating with other students*." Another student (B) remarked, "*I strongly hope that the chemistry education program can provide*

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opportunities for collaboration among students."

Table 5. Students' Perspectives and Experiences in Problem-Based Learning

Statement	Mean Score	Category
I have participated in learning that begins with a case study or contextual problem	4.00	Agree
I feel challenged to think critically when given a real-world problem to analyze	4.08	Agree
In problem-based learning, I find it difficult to develop problem-solving strategies	3.39	Neutral
I need clear guidance to understand and solve problems step-by-step	3.37	Agree
Average	3.80	Agree

Based on the data in Table 2, the average scores for *PBL Perspectives and Experiences* show that respondents have been exposed to case-based learning (M = 4.00) and feel challenged to think critically by authentic problems (M = 4.08). However, they also reported difficulties in formulating problem-solving steps (M = 3.39) and a need for step-by-step guidance (M = 3.37).

Table 6. Needs for an Integrated Collaborative PBL Platform

Statement	Mean Score	Category
I feel the need for a system that monitors each group member's contribution in online learning	4.17	Agree
I need a platform that can facilitate structured collaborative work	4.52	Strongly Agree
I am interested in a chemistry learning website that starts with real-world problems (problem-based learning)	4.69	Strongly Agree
I need a more interactive and team-based online learning platform	4.08	Agree
Average	4.37	Strongly Agree

These findings are supported by student interviews. Student C stated: *"I hope that this website can serve as a bridge between students and lecturers in completing projects by facilitating regular supervision or consultation sessions."* Student D also expressed: *"I hope that with this website, we as chemistry education students can improve our skills, both in communication and teamwork, as well as our skills in conducting problem-based learning."*

Table 7. Expected Features of a Collaborative PBL Platform

Statement	Mean Score	Category
I expect an online group work feature within a single platform (without needing to switch to WA/Zoom, etc.)	4.39	Strongly Agree
I require a lecturer consultation feature within the online learning platform	4.52	Strongly Agree
Features such as activity logs, reflection, and contribution rubrics will help improve learning motivation	4.21	Strongly Agree
I would like to upload group work results and receive immediate feedback	4.26	Strongly Agree
I would like to present project outcomes directly and discuss them in class	4.17	Agree
Average	4.31	Strongly Agree

These five areas complement each other and collectively map the workflow of collaborative PBL. This is reinforced by interview findings. Student E stated: *"In the developed website, I hope there will be a discussion forum among students."* Additionally,

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Student F mentioned: *"I hope for group assignments that can be accessed by all group members, scoring and feedback from tutors, freely accessible reference sources, and a graphic showing each member's work completion percentage to identify active and less active participants, along with chemistry materials that simplify difficult concepts."*

Expert Perspectives on the Initial Platform Design

The second part of this discussion presents findings on expert perspectives regarding the initial design of the collaborative PBL platform for distance education. The researcher adopted Arends' PBL syntax, which consists of: (1) orienting students to the problem, (2) organizing students for learning, (3) guiding individual or group investigation, (4) developing and presenting results, and (5) analyzing and evaluating the problem-solving process(Arends R.I, 2007). Based on this syntax, platform features were designed as presented in Table 8.

Table 8. Mapping of Platform Features to the Collaborative PBL Syntax

PBL Syntax Stage	Proposed Platform Features
1. Orienting students to the problem	Display of authentic contextual problems as learning triggers; introductory videos; clear learning objectives.
2. Organizing students for learning	Automatic group formation; workspace with role/task division; shared document editing.
3. Guiding individual or group investigation	Online discussion forums; synchronous meeting integration; lecturer consultation feature; curated references.
4. Developing and presenting results	Group project upload area; direct feedback tools; peer review; presentation mode within the platform.
5. Analyzing and evaluating problem-solving	Activity logs per member; contribution rubrics; reflection journals; summary dashboards.

Based on the proposed platform design, a focus group discussion (FGD) was conducted with four experts. They were asked to evaluate the initial design presented by the researchers.

Table 9. Alignment of platform design with PBL syntax

Expert	Response
A	*"The website design and features are relevant and reflect the five stages of the PBL syntax in full."*
B	*"It already reflects the PBL syntax, but attention is needed when transforming the syntax into a website interface."*
C	*"In general, it reflects the PBL syntax and the designed features are aligned with it."*
D	*"The website design and its features are relevant to the PBL syntax."*

As summarized in Table 9 above, the experts judged the design to be aligned with the five stages of PBL: problem orientation, organizing students for learning, guiding individual or group investigation, developing and presenting results, and analyzing/evaluating the problem-solving process. Moreover, the design mapped coherent features to each stage (e.g., a problem page with interactive highlights, group management and a planning canvas, activity logs/journals and a consultation channel, project upload and in-platform presentation with comments, as well as reflection–process review–improvement plans).

Table 10. Potential for implementing the collaborative PBL website in distance education

Expert	Response
A	*"This website can be implemented in distance education with several notes: navigation and the interface must be intuitive and user-friendly so that lecturers/students are not burdened technically, and a short*

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	initial training is needed so users understand the workflow and each feature."
B	*"A thorough analysis of student characteristics as users is needed to avoid obstacles during implementation."*
C	*"I believe the website can be implemented well, but each stage needs to be monitored to maximize its use."*
D	*"The website can be implemented and will support distance learning, but students' internet access capabilities must be considered."*

Drawing on Table 10, the findings indicate that the platform can be implemented for collaborative PBL in distance education provided three prerequisites are met: (i) an intuitive interface (ii) brief training so lecturers and students understand the workflow and core features (iii) mitigation of connectivity constraints through a low-bandwidth mode and asynchronous alternatives,.

Table 11. Key features proposed by experts

Expert	Response
A	*Automatic scheduling: synchronization with student/lecturer calendars; real-time monitoring so lecturers can track group/individual progress.*
B	*Presentation features should be more engaging and involve learners; notifications should be available in both lecturer and student accounts.*
C	*The planned features are good; ensure they are user-friendly and easy to use.*
D	*Virtual collaborative workspace, digital worksheets, lightweight reflection forum, and demo/presentation features.*

As shown in Table 11, the priority features proposed by experts are consistent with empirical evidence on online collaboration, feedback, and learning analytics.

Discussion

Students' Perspectives on Collaborative PBL in Distance Education

Based on the on Tabel 4 questionnaire, the average construct score for Collaboration Perspective during Distance Education indicates agreement with the statements that online learning remains task-centric (M = 3.39), fosters feelings of social isolation (M = 3.43), rarely involves group assignments (M = 3.65), lacks a dedicated system for collaboration (M = 4.00), and provides limited opportunities to develop collaborative skills (M = 3.30). Theoretically, these findings are consistent with prior studies indicating that strong social presence and teaching presence play a critical role in online learning satisfaction, persistence, and outcomes (Bali et al., 2024)(Turk et al., 2022). In the context of distance learning, limited interaction patterns and excessive emphasis on individual tasks often trigger perceptions of isolation; design policies that restructure dialogue, teamwork, and feedback mechanisms are required to address these issues(Hopwood, 2022).

Based on the data in Table 5, the average scores for *PBL Perspectives and Experiences* show that respondents have been exposed to case-based learning (M = 4.00) and feel challenged to think critically by authentic problems (M = 4.08). However, they also reported difficulties in formulating problem-solving steps (M = 3.39) and a need for step-by-step guidance (M = 3.37). Research on PBL emphasizes that problem-based learning must be grounded in clear facilitator roles (Giri, 2022), structured thinking processes, and organized group workflows to ensure that learning is more focused and does not impose excessive cognitive load (Sunariyati et al., 2014). In other words, while students already possess

knowledge of PBL, the operational mechanisms: consisting of clear workflows, scheduled discussions, and procedural support, need to be embedded within the platform design.

The results in Table 6 show that the average student rating for the *Need for an Integrated Collaborative PBL Platform* is very high (M = 4.37), encompassing the need for monitoring individual contributions (M = 4.17), structured teamwork (M = 4.52), interest in a real-world problem-based chemistry learning website (M = 4.69), and a more interactive, team-oriented online learning platform (M = 4.08). Practically, these needs are directly related to reducing context switching between multiple applications, strengthening team coordination, and tracking learning processes that can be used as the basis for formative feedback (Martin et al., 2020);(Ifenthaler et al., 2019). This confirms that the required platform is not merely a repository for materials but a communication bridge that provides regular consultations with lecturers and a structured collaboration space to foster communication, teamwork, and effective implementation of PBL. The implication is that the platform design should include features such as consultation scheduling/recording, an integrated group workspace (role–task division), and fast feedback to ensure that projects remain well-directed and progress is effectively monitored

The results in Table 7 indicate several key points. First, there is a strong need for an organized group learning feature (M = 4.39) that eliminates the need to switch between applications and enhances the continuity of interaction. Second, the lecturer consultation feature (M = 4.52) plays a vital role in strengthening teaching presence and clarifying student understanding (Castroverde & Acala, 2021). Third, activity logs, reflection tools, and contribution rubrics (M = 4.21) encourage accountability and feedback literacy (Carless & Boud, 2018). Fourth, the ability to upload group work and receive direct feedback (M = 4.26) accelerates the *feedforward* cycle and supports learning based on students' authentic outputs(Utha, 2023).Fifth, project presentations and discussions (M = 4.17) help develop audience awareness and scientific communication skills.

Expert Perspectives on the Initial Platform Design

Based on table 9, known that a key consideration raised was the need to ensure that the transformation of PBL syntax into a web interface remains faithful to pedagogical goals. This is consistent with evidence that the strength of PBL lies in the coherence among authentic problem-solving, teamwork, inquiry, synthesis, and reflection (Yew & Goh, 2016). Recent literature likewise emphasizes the importance of clearly defining the facilitator's role and the learning process design to maintain alignment with intended outcomes (Nursantalia Habeahan et al., 2023). Accordingly, expert validation that stresses feature–stage alignment supports the pedagogical validity of the proposed learning design.

Drawing on Table 10, the findings indicate that the platform can be implemented for collaborative PBL in distance education provided three prerequisites are met: (i) an intuitive interface that does not burden users—simple, well-structured navigation minimizes confusion and allows participants to focus on learning rather than on technicalities(Chairunnisa et al., 2024); (ii) brief training so lecturers and students understand the workflow and core features, this may take the form of a guided tour, short instructional videos, or an initial orientation session to align expectations and ensure readiness; and (iii) mitigation of connectivity constraints through a low-bandwidth mode and asynchronous alternatives, ensuring full participation even with limited internet access (Rahiem, 2020a). Once these prerequisites are met, the platform is expected to facilitate teamwork, structured task division, and timely feedback so that collaborative PBL can run optimally without technical disruptions.

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Based on table 11, known that features proposed by experts are automatic scheduling/calendar synchronization and notifications support team coordination, which instructional design studies have shown to enhance learner engagement (Alsaif, 2019). Real-time progress monitoring (progress dashboards) and per-member contribution logs align with learning analytics practices for awareness and self-regulation; dashboards built with meaningful indicators (beyond simple click counts) can help instructors steer learning and help students appraise their progress(Safsouf et al., 2022). Virtual collaborative spaces and digital worksheets are relevant to collaborative knowledge building in PBL, which requires shared spaces for discussion and well-documented processes (Liarokapis & Anderson, 2020). Reflection forums and presentation/demo features strengthen the feedback loop; timely, dialogic feedback has been shown to improve feedback literacy and the quality of learning improvement (Hattie & Clarke, 2018).

Overall, the expert evaluations support the pedagogical feasibility and implementation readiness of the design, while highlighting critical areas for refinement to ensure successful adoption in distance education. The convergence between expert views and recent empirical evidence suggests clear priorities for iteration: (1) maintain close alignment between features and PBL stage objectives; (2) simplify workflows and onboarding; (3) provide low-bandwidth and asynchronous options; and (4) deliver analytics/monitoring that are informative yet ethical. Adhering to these priorities is likely to result in a collaborative PBL platform that is functional, equitable, and impactful in distance learning contexts.

Contextual Implications for Indonesian Distance Education

The patterns emerging from result of this research mirror many of the real conditions of Indonesian distance education. Students reported limited interaction, feelings of isolation, and few opportunities to collaborate, issues that are still common where internet connectivity remains unstable, especially outside major cities(Rahiem, 2020);(Safitri et al., 2022). In practice, many learners are already comfortable using basic LMS features but still struggle with more complex, inquiry-based collaboration tools (Aldresti, 2023). This gap is not only technical but also cultural. In many cases, students are used to working independently, so group-based problem solving still feels unfamiliar (Sutarto et al., 2020). These findings suggest that a collaborative PBL platform should go beyond providing digital tools, it should also guide users step by step in how to work together online. Features that scaffold group roles, monitor participation, and include short digital literacy modules can help users build both confidence and collaboration habits. Institutional commitment, such as mentoring by lecturers and continuous technical support, is equally important if such a platform is to work well in large-scale systems like Universitas Terbuka.

The study also adds to current discussions on how problem-based and collaborative learning can be adapted for distance education. The results show that elements such as social presence, teaching presence, and structured feedback, captured through features like consultation channels, reflection tools, and activity logs, can actually be built into one integrated system. This supports the ideas in the Community of Inquiry (CoI) framework (Garrison, 2016). showing that meaningful presence is not just social but also technological. At the same time, the platform's design shows how pedagogy and technology can be aligned. The clear workflow, transparent contribution tracking, and dialogic feedback reflect view of learning as a design process. Together, these findings bridge theory and practice: they show that collaborative PBL can be implemented in a single digital environment without losing its core principles of teamwork, inquiry, and reflection (Yew & Goh, 2016).

Conclusion

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This study produced an initial design for a collaborative PBL platform that is relevant to distance learning, supported by strong user demand and expert validation. Students indicated a high need for integrated features: collaboration, consultation, direct feedback, contribution tracking, and presentation in a single, structured digital ecosystem. Experts confirmed alignment with PBL stages, while emphasizing three prerequisites for successful implementation: an easy-to-use interface, concise orientation/training, and support for low connectivity. The study contributes to the online PBL literature by offering a design model that integrates collaboration, process transparency, and sustained interaction. Future work will involve deeper expert validation and prototype trials to ensure the platform effectively addresses collaboration challenges in distance education.

Recommendation

Future research should prioritize developing and testing a prototype of the collaborative PBL platform in real distance learning contexts, with broader expert involvement to ensure its relevance across disciplines. Enhancements such as automated feedback, adaptive collaboration tools, and mobile accessibility are suggested to strengthen sustained interaction and learning outcomes. For lecturers, follow-up actions are essential to maximize the platform's impact. Lecturers should receive targeted training not only on the technical use of the platform but also on how to design, facilitate, and assess collaborative PBL activities effectively in online settings. They are encouraged to act as facilitators who monitor group dynamics, provide formative feedback, and promote equal participation among students. Furthermore, lecturers can contribute to continuous improvement by sharing classroom-based insights and usage data with developers or instructional designers. This feedback loop will help refine platform features, align them with authentic pedagogical needs, and foster a sustainable culture of collaborative, problem-based learning in distance education.

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