Available online at website: https://jurnal.iaii.or.id/index.php/RESTI

JURNAL RESTI
(Rekayasa Sistem dan Teknologi Informasi)
Vol. 10 No. 5 (2026) 1569 - 1580 e-ISSN: 2580-0760

Educloud: Development of an Integrated Digital Learning Platform Based on Cloud Computing, LMS, Artificial Intelligence, and Edupreneurship

Arafah Husna[1], I Nyoman Sudana Degeng[2], Punaji Setyosari[3], Dedi Kuswandi[4], Ahmad Fahmi[5], M. Zainal Arifin[6], Aripriharta[7]
[1,2,3,4]Department of Educational Technology, Faculty of Education, Universitas Negeri Malang, Malang, Indonesia
[5,6,7]Department of Electrical Engineering and Informatics, Universitas Negeri Malang, Malang, Indonesia

*arafah.husna.2401219@students.um.ac.id

Abstract

This study evaluated the initial feasibility and practicality of Educloud, a cloud-based digital learning platform integrating Learning Management System functions, digital assessment, learner-progress monitoring, and an AI-supported Edupreneurship workflow. Educloud was developed using Laravel and PostgreSQL, with AI functionality provided through the Google Gemini Developer API using the gemini-2.5-flash model. The AI component processes pseudonymised learner and team profiles to generate business-idea recommendations and formative feedback. The study employed a research and development approach based on an adapted ADDIE model, involving three expert validators and ten users in a small-group trial. Functional testing assessed API connectivity, contextual-data processing, privacy protection, response validation, storage, and error handling. Expert validation produced a score of 489 out of 525 (93.14%), a mean of 4.66, and an Aiken's V of 0.91. The small-group trial produced a score of 1,117 out of 1,250 (89.36%), a mean of 4.47, and a Cronbach's alpha of 0.93. The findings indicate that Educloud demonstrates strong initial feasibility and practicality. Further field testing is required to evaluate the accuracy of AI-generated recommendations and their effects on learning and Edupreneurship outcomes.

Keywords: artificial intelligence in education; cloud learning; educloud; edupreneurship; expert validation; LMS development; small-group testing

How to Cite: A. . Husna, "Educloud: Development of an Integrated Digital Learning Platform Based on Cloud Computing, LMS, Artificial Intelligence, and Edupreneurship", *J. RESTI (Rekayasa Sist. Teknol. Inf.)* , vol. 10, no. 5, pp. 1569–1580, Oct. 2026, doi: 10.29207/resti.v10i5.7843.
Permalink/DOI: https://doi.org/10.29207/resti.v10i5.7843

Received: May 13, 2026
Accepted: September 23, 2026
Available Online: October 31, 2026

This is an open-access article under the CC BY 4.0 License
Published by Ikatan Ahli Informatika Indonesia

1. Introduction

Digital education over the past five years has shifted from an emergency response to an ecosystem-based model. During the initial phase of the COVID-19 pandemic, many institutions adopted digital platforms primarily to ensure continuity of learning. As the crisis subsided, however, expectations of educational technology grew substantially more complex: platforms are now expected not only to host instructional materials but also to support instructional design, classroom management, assessment, learner engagement, learning analytics, data governance, and the economic sustainability of learning [1], [2]. This shift has repositioned the Learning Management System (LMS) as strategic infrastructure rather than a mere administrative application.

Recent literature emphasises that system quality, information quality, and service quality are central determinants of e-learning success. [3] demonstrated that user experience, satisfaction, and net benefits of e-learning systems depend on the alignment between technical features and pedagogical needs. Convergent findings from [4-6] identify perceived ease of use, usefulness, self-efficacy, interaction, and content quality as principal factors in online learning acceptance. Accordingly, a high-quality LMS must be technically stable while also enabling instructors to design meaningful learning experiences and supporting learners in monitoring their progress.

Within this context, Educloud can be interpreted as an effort to build a more integrated educational platform. According to its user documentation, Educloud is

designed as an all-in-one educational platform that unifies LMS functionality, course management, student interaction, administration, learning evaluation, and an AI-supported Edupreneurship module for course development and educational entrepreneurship [7]. The documentation specifies three differentiated user roles each with tailored functions. Administrators manage users, course categories, site configurations, and revenue metrics; tutors create courses, upload materials, structure curricula, manage assessments, and publish courses; and students register, update profiles, enrol in courses, and monitor their learning progress.

The need for platforms such as Educloud is increasingly relevant because LMS use has become standard practice in digital education ecosystems, even though many systems still face challenges related to interoperability, data fragmentation, and uneven user capacity. [8] argues that LMSs and other digital tools must be understood as components of a broader digital education ecosystem rather than as stand-alone applications. [9] likewise cautions that educational technology should be evaluated on the basis of evidence, equity, scalability, and instructional usefulness, not merely on the appeal of innovation. Any analysis of Educloud must therefore assess the extent to which its features address the systemic, pedagogical, administrative, and ethical demands of digital education.

Learner engagement is a second central concern. The systematic evidence map by Bond et al. (2020) shows that engagement in technology-mediated learning extends beyond online attendance to include behavioural, cognitive, affective, and social dimensions. Platforms that provide learning progress indicators, activity histories, quizzes, assignments, and learning communication can foster self-regulated learning when feedback is clear and actionable [10], [11]. The profile and progress features of Educloud therefore have potential as a foundation for learning analytics, although the validity of their benefits remains contingent on empirical data.

Digital assessment constitutes a third inseparable dimension of contemporary LMSs. Online assessment requires academic integrity, rubric transparency, data security, and task designs that elicit reasoning processes rather than terminal answers [12], [13]. When a platform offers quizzes and assignments, the pedagogical challenge is to ensure that assessment is not a mere transposition of conventional examinations into online spaces but instead supports formative feedback, personalisation, and defensible evidence of learning. This requirement has intensified with the emergence of generative AI, which makes academic integrity and AI literacy new prerequisites in assessment design [14], [15].

AI in education represents the fourth dimension. Recent AI developments create opportunities for personalisation, recommendation, automated feedback, predictive analytics, and content authoring support. These opportunities are inseparable from risks related to bias, privacy, cognitive over-reliance, transparency, and accountability [16], [17]. [18] report that AI research in higher education is expanding rapidly, but meaningful implementation continues to depend on pedagogical design, instructor readiness, and institutional governance. The AI-based Edupreneurship module in Educloud should therefore be positioned as a support tool for ideation and course development, not as a substitute for the academic authority of the tutor.

Edupreneurship is the principal feature that distinguishes Educloud from conventional LMSs. Entrepreneurship education in digital environments requires not only business content but also learning environments that promote opportunity exploration, team formation, idea validation, market reflection, and the capacity to package knowledge into learning products [19], [20]. Research on online entrepreneurship education demonstrates that entrepreneurial learning relies on experiential, collaborative, and project-based activity rather than conceptual exposition alone [21], [22]. By providing user profiling, team management, and AI-supported ideation, Educloud can potentially link content learning with the logic of course production and value creation.

A research gap nonetheless remains. Many LMS studies focus on user acceptance, online learning effectiveness, or AI adoption in general terms, whereas studies of platforms that integrate LMS, AI, and edupreneurship are still scarce. Studies of educational products also tend to be largely descriptive and rarely assess the alignment between system features, learning theory, user needs, and empirical evaluation indicators. The present study addresses this gap by developing an R&D manuscript on Educloud that combines conceptual analysis, product documentation, expert validation, and small-group testing as the basis for an initial evaluation.

This study addresses five objectives and corresponding questions: (1) how to develop Educloud as an integrated cloud-based LMS; (2) how its AI-supported Edupreneurship architecture processes and protects learner and team profiles when generating business ideas and formative feedback; (3) whether the AI workflow functions as specified; (4) how experts assess its feasibility; and (5) how users assess its initial practicality in a small-group trial.

As an R&D manuscript, this paper foregrounds not the mere presence of features but the extent to which those features can be embedded within an instructional design cycle that is usable, assessable, revisable, and retestable. This stance is important because educational technology products are often judged by technical sophistication, even though their usefulness is ultimately determined by the coherence among learning goals, activities, assessment, user support, and data ethics [3], [9], [16]. Educloud is therefore analysed as a pedagogical-technological product rather than simply as a course management application.

Figure 1 presents the R&D workflow used in this study, illustrating that Educloud was developed through staged procedures progressing from needs analysis to a final product ready for broader testing.

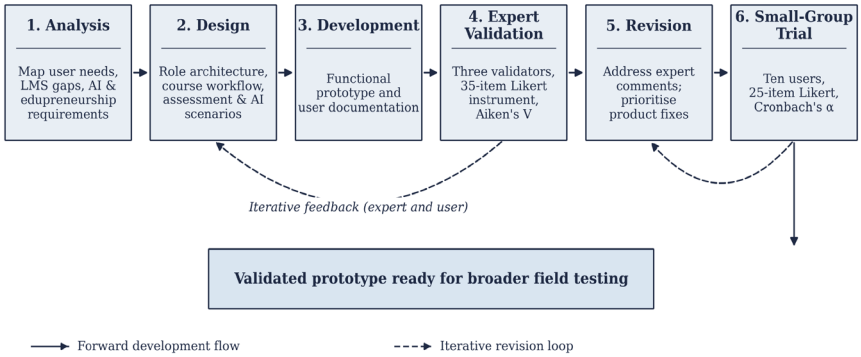


Figure 1. Research and development workflow for Educloud based on the adapted ADDIE model

2. Methods

2.1 Research Design

This study employed a research and development (R&D) approach using an adapted ADDIE model [23]. ADDIE was selected because it is appropriate for educational products that require needs analysis, systematic design, prototype development, iterative evaluation, and product revision.

In this study, ADDIE is treated not as a rigid linear procedure but as an iterative framework that allows expert and user feedback to be channelled back into the design and development phases. Within this framework, Educloud is positioned as a digital learning product to be assessed across pedagogy, usability, interface design, functionality, assessment support, and edupreneurship support.

2.2 Object of Study and Data Sources

The object of this study is the Educloud platform. According to the user documentation, Educloud encompasses administrator account management, tutor management, course creation, category management, site configuration, student registration, profile updating, course enrolment, progress tracking, and the Edupreneurship module.

The primary source for mapping product features was the Educloud User Guide dated 27 October 2025. Secondary sources comprised recent scientific literature on e-learning, LMSs, AI in education, digital assessment, student engagement, and entrepreneurship education.

2.3 Evaluation Participants

The evaluation involved two groups of participants. The first group comprised three experts who served as product validators: an expert in content and digital pedagogy, an expert in instructional media and technology, and an expert in language and instructional design. The second group comprised ten users participating in a small-group trial.

In a field implementation, the small-group sample would be drawn from students, early-career tutors, or prospective LMS users who would perform tasks including registration, course exploration, content access, assessment use, progress monitoring, and exploration of the Edupreneurship module.

2.4 Instruments

Three instruments were used in this study: an expert-validation instrument, a small-group practicality instrument, and a technical-verification checklist for the AI-supported Edupreneurship module. The expert-validation instrument used a five-point Likert scale ranging from 1 (“strongly inappropriate”) to 5 (“strongly appropriate”). It consisted of 35 items covering six dimensions: (a) content and pedagogical quality, (b) LMS design and ease of use, (c) interface and media quality, (d) assessment and learning-progress support, (e) Edupreneurship and AI support, and (f) language and accessibility [3].

The Edupreneurship and AI dimension consisted of five indicators: (1) the relevance of AI-generated business ideas to learner or team profiles; (2) the compliance of recommendations with predefined constraints, including budget, duration, available resources, and target users; (3) the clarity and pedagogical usefulness of the formative feedback; (4) the transparency of the AI role and the preservation of tutor authority; and (5) the adequacy of data-minimisation, pseudonymisation, response-validation, and failure-handling mechanisms.

The small-group practicality instrument comprised 25 five-point Likert items covering five dimensions: ease of use, learning usefulness, display and navigation, assessment and learning progress, and Edupreneurship and AI. The AI-related items assessed whether users could complete the profiling and constraint forms, understand the generated recommendations, perceive alignment between the recommendations and their contextual data, identify the suggested risks and next steps, and distinguish AI-generated feedback from authoritative tutor assessment.

A technical checklist assessed the AI workflow specified in Tables 1 and 2: API connectivity,

authentication and authorisation, PostgreSQL context retrieval, identifier exclusion, prompt construction, JSON-schema and entrepreneurial-constraint compliance, storage, controlled retry, fallback, and latency. Functional requirements used pass–fail results; latency used numerical measurements. These system-behaviour measures remained separate from perceived feasibility and practicality.

Table 1. Indicators used to evaluate the AI-supported Edupreneurship component.

Evaluation aspect	Indicator
Context relevance	The generated idea reflects the learner or team profile
Constraint compliance	The recommendation complies with budget, duration, resources, and target users
Feedback usefulness	The feedback identifies strengths, risks, and actionable next steps
Output clarity	The generated information is understandable and systematically presented
Human oversight	Users understand that tutors retain final academic authority
Data protection	Direct personal identifiers are excluded from external requests
Output validation	Required response fields and constraints are automatically checked
Failure handling	Invalid responses trigger retry or fallback procedures
Response storage	Validated output is stored in the Educloud database
Response latency	The processing time from request to displayed feedback is recorded

Table 2. Technical verification scenarios for the AI-supported Edupreneurship module.

Test scenario	Expected result
API connectivity	Laravel successfully connects to the external LLM service
Authentication and authorisation	Only authorised Educloud users can access the AI service
Context retrieval	Relevant profile, team, and project data are retrieved from PostgreSQL
Pseudonymisation	Names, student IDs, email addresses, and phone numbers are excluded
Structured output	The response contains all required JSON fields
Constraint compliance	Recommendations comply with budget, duration, resources, and target users
Response storage	Validated feedback is stored in the Educloud database
Invalid-response handling	The system initiates a controlled retry
External-service failure	A fallback message is displayed, and the failure is logged
Response latency	Processing time is recorded for each request

2.5 Development Procedure

Development followed five iterative ADDIE phases. Analysis identified administrator, tutor, and student requirements, fragmented-system limitations, and functions for courses, assessment, progress, teamwork, ideation, and projects. It also specified learner-profile and project-context variables and classified identifiers prohibited from external AI requests.

Design specified role-based interfaces, workflows, database relationships, prompt and JSON schemas, validation, and privacy controls across the interface, Laravel, PostgreSQL, AI-service, external-LLM, and validation layers. Development implemented these modules and integrated gemini-2.5-flash through the Google Gemini Developer API. Server-side integration protected credentials; Sections 2.6 and 2.7 describe contextual processing, output fields, and safeguards.

Technical verification preceded expert and user evaluation and covered connectivity, access control, context retrieval, pseudonymisation, output and constraint validation, latency, storage, and failure handling. Invalid JSON triggered one correction request, then a logged fallback if unresolved. Experts assessed product quality; users completed account, course, progress, profiling, constraint-submission, ideation, and feedback tasks. Quantitative findings, technical logs, and qualitative comments informed revisions to navigation, guidance, prompts, presentation, validation, privacy, and fallback messages before broader testing.

2.6 AI Integration and User-Profile Processing

Educloud's Laravel AI service accesses gemini-2.5-flash through the server-side Google Gemini REST API to generate structured business ideas and formative feedback. It retrieves PostgreSQL records on profiling, interests, competencies, team composition, resources, target users, budget, duration, prior ideas, and project development. It excludes direct identifiers and separates external-model communication from the interface and core LMS. This contextual service does not operate as a general-purpose chatbot.

Learner profiles are processed using a combination of numerical aggregation and semantic categorisation. Responses to five-point profiling items are normalised to a range of 0–1 and grouped according to the profiling dimensions defined in the Educloud instrument, such as entrepreneurial competency, interest, preferred role, and resource readiness. The score of learner i for dimension d is calculated using Equation 1.

$$S_{id} = \frac{1}{m_d} \sum_{j=1}^{m_d} \left(\frac{x_{ij}-1}{4} \right) \quad (1)$$

x_{ij} is the response of learner i to item j, and m_d is the number of items assigned to dimension d. This transformation produces a dimensional score between 0 and 1. Equal item weights are applied in the current implementation to maintain interpretability and avoid unsupported weighting assumptions.

Team profiles use the mean of members' dimensional scores. Textual interests, sectors, skills, and limitations become predefined contextual categories. Scores and categories enter the prompt with budget, duration, resources, target users, and local business constraints. For example, a pseudonymised team profile may combine high communication readiness, moderate digital-production competency, educational-service interests, limited funding, and a one-semester

timeframe. Recommendations thus reflect processed profiles and constraints.

Context-aware, constraint-based prompts request the business problem, proposed idea, target users, value proposition, profile alignment, feasibility analysis, risks, and next steps. Educloud uses direct database-grounded contextual prompting rather than a full Retrieval-Augmented Generation pipeline: it retrieves structured relational data without embeddings, a vector database, or semantic search over an external repository. Responses undergo field and constraint validation before database storage and near-real-time display as formative feedback.

2.7 AI Data Flow and Privacy Protection

AI requests pass through the Laravel controller, which authenticates users, retrieves relevant PostgreSQL context, and forwards it to the server-side AI service. Context includes normalised profiles, interests, team competencies, resources, budget, target users, duration, previous ideas, and project records. Data minimisation retains only required attributes and excludes names, student IDs, emails, telephone numbers, and institutional account identifiers.

Internal learner and team identifiers become temporary request codes such as Learner_A and Team_01. Their mapping remains on the Educloud server. Pseudonymised context, instructional tasks, constraints, and response schemas travel to Gemini over HTTPS. Credentials remain in server-side environment variables; authentication and authorisation control access. The client never accesses the external API directly.

Validation checks required JSON fields, numerical ranges, and budget, duration, resource, and target-market constraints. Invalid responses trigger a correction prompt; unresolved failures produce a fallback and technical log. Valid outputs are stored with request ID, model, status, processing time, validation result, and timestamp. Detailed contextual prompts are not permanently retained; summarised prompts and non-identifying audit parameters support traceability.

Learners receive the output as formative assistance requiring further examination. Tutors may review, revise, accept, or reject it and retain final academic authority. Human oversight complements the technical privacy controls.

Figure 2 summarises the separation of interface, application, database, AI service, external model, and validation layers. It shows server-side context retrieval, minimisation, pseudonymisation, encrypted prompting, response validation, storage, and feedback display.

This architecture keeps credentials, internal identifiers, and personally identifiable information on the server. Validation, controlled retry, and fallback govern the delivery of external-model responses.

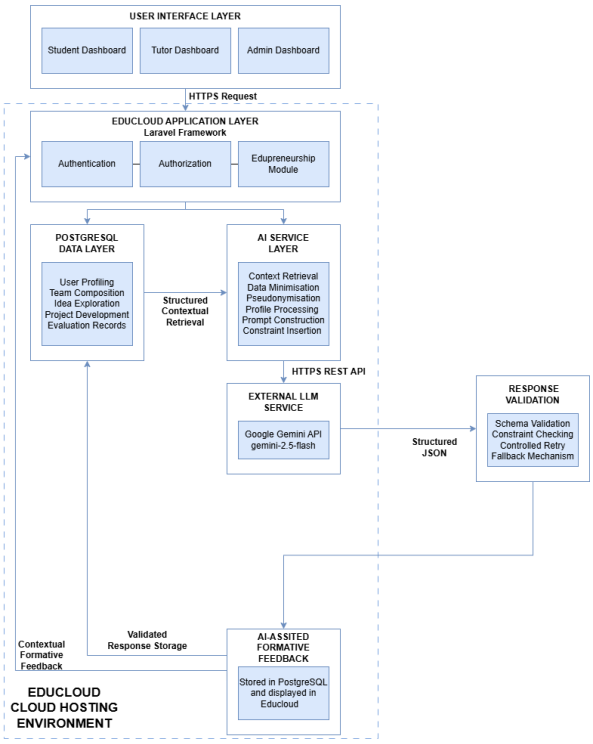


Figure 2. Technical architecture and AI data flow of the Educloud platform.

2.8 Data Analysis

The data analysis distinguished among expert feasibility, user practicality, and technical performance of the AI-supported Edupreneurship module. These three forms of evidence were analysed separately because expert and user perceptions do not directly demonstrate whether the AI component operates according to its technical specifications. Data from the expert-validation and small-group trials were analysed using descriptive statistics. The feasibility and practicality percentages were calculated using Equation 4.

$$P = \frac{S_o}{S_m} \times 100\% \quad (4)$$

P represents the percentage score, S_o is the observed score, and S_m is the maximum possible score. The mean was used to describe the central tendency of participant responses, while the standard deviation was used to examine response variability.

The agreement of the expert validators on item relevance was analysed using Aiken's V, as presented in Equation 5.

$$V = \frac{\sum s}{n(c-1)} \quad (5)$$

$s = r - l_o$, r is the score assigned by a validator, l_o is the lowest possible score, n is the number of validators, and c is the number of response categories. Aiken's V values range from 0 to 1, with values approaching 1 indicating stronger agreement among the validators.

Cronbach's alpha assessed the practicality instrument's internal consistency, not effectiveness or construct

validity. Thematic analysis grouped expert and user comments by pedagogy, interface and navigation, assessment, contextual relevance, constraint compliance, feedback clarity, privacy, human oversight, and failure handling.

Table 3 distinguishes expert validation, user practicality, AI technical verification, and revision, including participants, test units, evaluation focus, and analyses.

Table 3. Design of evaluation and analysis procedures.

Stage	Participants or test units	n	Evaluation focus	Statistics or analysis
Expert trial	Content and pedagogy, media and instructional technology, and language and instructional design experts	3	Content, pedagogical quality, system features, interface, assessment, Edupreneurship, AI support, language, and accessibility	Mean, standard deviation, percentage, and Aiken's V
Small-group trial	Early users of Educloud	10	Ease of use, learning usefulness, navigation, assessment, progress monitoring, business-idea exploration, and AI-assisted formative feedback	Mean, standard deviation, percentage, and Cronbach's alpha
AI technical verification	AI requests and predefined system-test scenarios	30	API connectivity, authentication, contextual-data retrieval, pseudonymisation, structured output, constraint compliance, response storage, controlled retry, fallback behaviour, and response latency	Pass–fail results, success rate, compliance rate, frequency, mean, standard deviation, minimum, and maximum
Product revision	Development team	–	Improvements based on expert, user, and technical-verification findings	Thematic analysis of comments and technical logs

Table 4 classifies feasibility and practicality percentages. Technical verification used separate functional and operational indicators.

Table 4. Interpretation criteria for product feasibility and practicality.

Percentage range	Category	Development decision
81–100%	Highly feasible / highly practical	Usable with minor revision
61–80%	Feasible / practical	Usable after limited revision
41–60%	Adequate	Substantial revision and retesting required
21–40%	Poor	Major aspects require redesign
0–20%	Not feasible	Product not yet usable

Technical-verification data were analysed using pass–fail results and operational metrics. The technical success rate was calculated using Equation 6.

$$TSR = \frac{N_p}{N_t} \times 100\% \quad (6)$$

SR is the technical success rate, N_p is the number of successfully completed test scenarios, and N_t is the total number of technical test scenarios.

Technical indicators covered successful API requests, authorised access, context retrieval, identifier exclusion, JSON-schema and constraint compliance, validated-response storage, retries, fallbacks, and latency. Latency used the mean, standard deviation, minimum, and maximum. Any transmission of direct personal identifiers counted as a technical failure requiring revision before further user testing.

Expert and user ratings of recommendation relevance and pedagogical usefulness remained descriptive and separate from technical scores. Neither positive perceptions nor functional verification establishes learning effectiveness. Claims about learning, entrepreneurial competence, engagement, or proposal quality require larger field studies with experimental, quasi-experimental, or mixed-methods designs.

3. Results and Discussions

3.1 Description of the Educloud Product

Educloud integrates cloud-based LMS administration, courses, digital assessment, progress monitoring, and Edupreneurship through Laravel and PostgreSQL. Administrator, tutor, and student roles support governance, course authoring and assessment, and learning participation respectively [7]. Edupreneurship links profiling, teamwork, idea exploration, project development, and evaluation using stored interests, competencies, roles, resources, and limitations.

The implemented Gemini service retrieves pseudonymised context and generates constraint-based JSON recommendations as described in Sections 2.6 and 2.7. Output includes the business problem, idea, target users, value proposition, profile alignment, feasibility, risks, and next steps. Validation precedes storage and display; invalid output triggers retry or fallback. Tutors retain authority to review, modify, accept, or reject the formative feedback.

Figure 3 presents the technical architecture and AI data flow of Educloud. It illustrates the interaction among the user-interface layer, Laravel application layer, PostgreSQL data layer, AI service layer, external LLM service, response-validation layer, and formative-feedback component. Functional verification tested the implemented workflow against the Figure 2 architecture, including server-side Gemini connectivity, context processing, privacy, structured output, validation, storage, and failure handling. Table 5 reports the results.

The workflow processed pseudonymised context, obtained and validated structured LLM responses, and displayed feedback. These functional results establish

conformity with the specified workflow, not recommendation accuracy or pedagogical effectiveness.

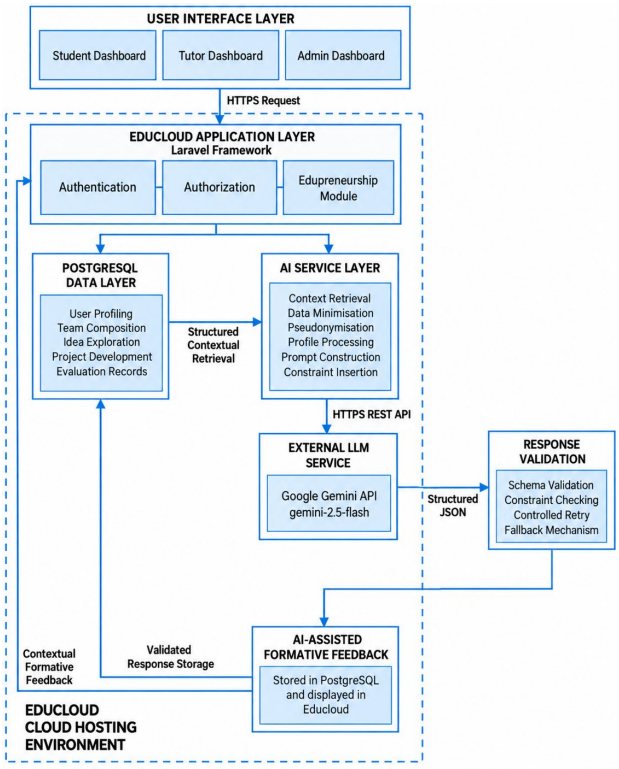
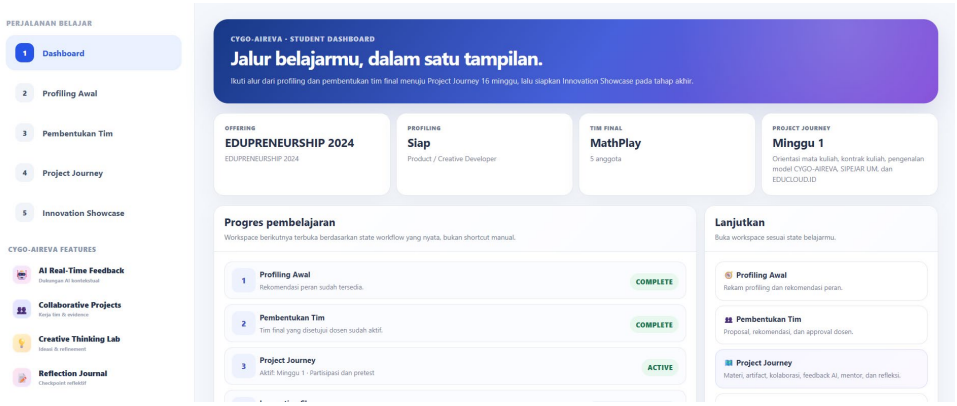
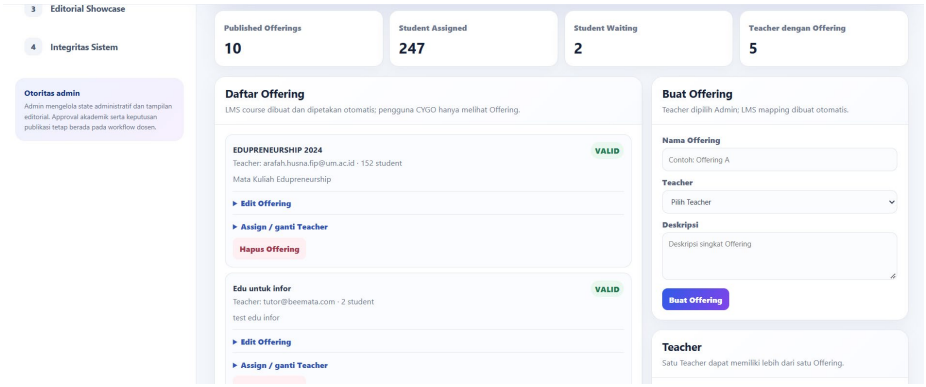


Figure 3. Technical architecture and AI data flow of the Educloud platform.



a. Main platform



b. User management dashboard.

Figure 4. Educloud platform

Table 5. Functional verification of the AI-supported Edupreneurship module.

Functional verification item	Expected system behaviour	Result
External LLM connection	The Laravel server successfully connects to the Google Gemini Developer API	Pass
Contextual-data retrieval	Relevant learner, team, and project data are retrieved from PostgreSQL	Pass
Data minimisation	Only data required for generating recommendations are included	Pass
Pseudonymisation	Names, student IDs, email addresses, and telephone numbers are excluded	Pass
Context-aware prompting	The prompt incorporates relevant learner and team context	Pass
Constraint-based prompting	The prompt includes budget, duration, resources, and target-user limitations	Pass
Structured response	The model returns the required fields in JSON format	Pass
Response validation	Required fields and entrepreneurial constraints are automatically checked	Pass
Response storage	Validated feedback is stored in the PostgreSQL database	Pass
Controlled retry	An invalid or incomplete response initiates a correction request	Pass
Fallback mechanism	A fallback message is displayed when a valid response cannot be produced	Pass
Feedback display	Validated formative feedback is displayed through the Educloud interface	Pass

Table 6. Main components and functions of the Educloud platform.

Component	Implemented functions	Pedagogical or administrative role
Administrator module	User-account management, course-category management, access control, site configuration, and platform information management	Supports platform governance, role management, and consistency of system administration
Tutor module	Course and curriculum authoring, content management, quizzes, assignments, rubrics, learner-progress monitoring, and review of Edupreneurship projects	Supports instructional design, assessment, formative feedback, and tutor supervision
Student module	Registration, profile management, course enrolment, content access, assessment completion, progress monitoring, and participation in Edupreneurship activities	Supports access to learning, self-regulation, assessment participation, and project-based activity
Learner-profiling module	Collection and processing of entrepreneurial interests, competencies, preferred roles, resources, and project limitations	Provides structured contextual data for team activities and AI-supported recommendations
Team and project module	Team formation, team-member management, idea records, project development, and evaluation records	Supports collaborative and experiential entrepreneurship learning
AI-supported idea exploration	Context retrieval, profile processing, constraint insertion, prompt construction, and generation of structured business-idea recommendations	Supports contextual ideation and early-stage project exploration
AI-assisted formative feedback	Feasibility analysis, profile alignment, risk identification, and recommended next steps	Provides actionable feedback while preserving tutor authority
Response-validation mechanism	JSON-schema validation, entrepreneurial-constraint checking, controlled retry, fallback handling, and response logging	Improves output consistency, traceability, and technical reliability
Privacy-protection mechanism	Data minimisation, pseudonymisation, server-side API-key storage, and exclusion of direct identifiers	Reduces disclosure of personally identifiable information to the external LLM provider
Cloud-based LMS infrastructure	Online access, centralised data management, role-based services, and integration of learning and Edupreneurship records	Supports access flexibility, system integration, and scalable learning management

Table 6 summarises the principal components of Educloud, their implemented functions, and their pedagogical or administrative roles. Educloud connects LMS processes with profiling, collaborative projects, contextual AI ideation, and formative feedback. Its contribution lies in embedding the LLM within a structured Edupreneurship workflow supported by learner and team data.

3.2 Expert Validation Results

Three experts completed 35 items, with a maximum of 175 points each (Table 7). Scores were 158 (90.29%), 164 (93.71%), and 167 (95.43%), totalling 489/525 (93.14%). The item mean was 4.66 (SD = 0.48); Aiken's V = 0.91 indicated strong agreement on item feasibility.

Table 7. Summary of expert validation results per validator.

Validator	Score	Maximum score	Percentage	Mean	Category
Expert 1	158	175	90.29%	4.51	Highly feasible
Expert 2	164	175	93.71%	4.69	Highly feasible
Expert 3	167	175	95.43%	4.77	Highly feasible
Total / Mean	489	525	93.14%	4.66	Highly feasible

All dimensions were highly feasible (Table 8). Content and pedagogy scored lowest, indicating priorities for learning-objective examples, activity scenarios, assessment rubrics, and tutor guidance on content–assessment alignment rather than architectural revision.

Table 8. Expert validation results by dimension.

Dimension	Items	Score	Max.	Mean	SD	%	Aiken's V
Content and pedagogy	7	95	105	4.52	0.51	90.48%	0.88
LMS design and ease of use	7	98	105	4.67	0.48	93.33%	0.92
Interface and media	7	97	105	4.62	0.50	92.38%	0.90
Assessment and progress	5	73	75	4.87	0.35	97.33%	0.97
Edupreneurship and AI	5	70	75	4.67	0.49	93.33%	0.92
Language and accessibility	4	56	60	4.67	0.49	93.33%	0.92

3.3 Product Revisions Based on Expert Feedback

Expert comments identified revisions to user flows, rubrics, AI transparency, data protection, progress presentation, and accessible language. Table 9 presents the pedagogical and technical priorities and design responses.

AI revisions added server-side separation, data minimisation, pseudonymisation, structured-response validation, and controls preventing direct display of invalid output. Tutor review, revision, acceptance, or rejection complemented these technical safeguards.

Table 9. Product revisions based on expert feedback.

Expert finding	Risk if not addressed	Implemented / planned revision
Initial tutor instructions are too technical	Novice tutors require more time to create courses	Add onboarding guides and example course templates
Assignment rubrics are not explicit across task types	Assessment may become inconsistent	Add rubrics, scoring criteria, and formative feedback examples
The technical role, data flow, and protection mechanisms of the AI-supported Edupreneurship module require clarification	The technical role, data flow, and protection mechanisms of the AI-supported Edupreneurship module require clarification	The technical role, data flow, and protection mechanisms of the AI-supported Edupreneurship module require clarification
Several menu labels need simplification	Students may misinterpret menu functions	Simplify terminology and add microcopy on key pages
The progress dashboard is insufficiently reflective	Progress is reduced to a completion percentage	Add attainment indicators, pending activities, and recommended next steps
The protection of learner data in communication with the external LLM provider must be technically specified	The protection of learner data in communication with the external LLM provider must be technically specified	The protection of learner data in communication with the external LLM provider must be technically specified

3.4 Small-Group Trial Results

Ten users completed 25 items, with a maximum of 125 points each (Table 10). Scores totalled 1,117/1,250 (89.36%); the item mean was 4.47 and the SD of participant totals was 7.70. Cronbach's alpha = 0.93 indicated excellent initial internal consistency.

Table 10. Small-group trial scores per participant.

Participant	Score	Max	Percentage	Mean	Category
P1	109	125	87.20%	4.36	Highly practical
P2	104	125	83.20%	4.16	Highly practical
P3	115	125	92.00%	4.60	Highly practical
P4	107	125	85.60%	4.28	Highly practical
P5	99	125	79.20%	3.96	Practical
P6	108	125	86.40%	4.32	Highly practical
P7	124	125	99.20%	4.96	Highly practical
P8	113	125	90.40%	4.52	Highly practical
P9	119	125	95.20%	4.76	Highly practical
P10	119	125	95.20%	4.76	Highly practical
Total / Mean	1,117	1,250	89.36%	4.47	Highly practical

All dimensions were highly practical (Table 11). Lower ratings for learning usefulness and Edupreneurship–AI indicate priorities for concrete examples, project scenarios, and clearer explanations of feature benefits for new users.

Figure 5 maps system quality and AI support as inputs, learning activity as process, and satisfaction, engagement, course completion, and digital readiness as outcomes. It guides subsequent evaluation and does not represent a causal model.

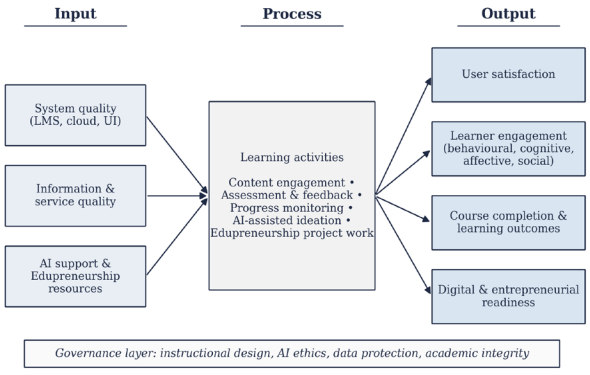


Figure 5. Conceptual framework for evaluating Educloud in subsequent studies.

Table 11. Small-group trial results by dimension.

Dimension	Items	Score	Max.	Mean	SD	%	Category
Ease of use	5	227	250	4.54	0.37	90.80%	High prac.
Learning usefulness	5	221	250	4.42	0.36	88.40%	High prac.
Display and navigation	5	224	250	4.48	0.32	89.60%	High prac.
Assessment and progress	5	227	250	4.54	0.37	90.80%	High prac.
Edupreneurship and AI	5	218	250	4.36	0.28	87.20%	High prac.

3.5 Summary of Statistical Findings

Two patterns emerged from the descriptive analyses of the data. First, expert validation produced very high feasibility percentages and a strong Aiken's V index, indicating that the Educloud prototype is sufficiently designed to warrant user testing as shown in Figure 12.

Table 12. Summary of the principal statistics of the development study.

Component	n	Items	Total score	Percentage	Mean	SD	Additional index
Expert trial	3	35	489 / 525	93.14%	4.66	0.48	Aiken's V = 0.91
Small-group trial	10	25	1,117 / 1,250	89.36%	4.47	7.70	Cronbach's α = 0.93

4. Discussions

Educloud's integration of LMS, assessment, progress tracking, and Edupreneurship shows initial design feasibility. The e-learning success framework links system, information, and service quality with satisfaction, use, and net benefits [3]. Evaluation should therefore assess how features enable learning design, monitoring, assessment, and improvement, rather than feature counts.

Strong interface, assessment, and language ratings suggest design potential for diverse users. Lower content and pedagogy ratings indicate a need for instructional support. Effective digital teaching requires teacher presence, structured activities, interaction, feedback, and assessment alignment [24], [25]. Educloud should provide objective and activity templates, rubrics, and formative-feedback guidance.

Initial users found the workflows practical, consistent with acceptance research emphasising ease of use, usefulness, self-efficacy, and facilitating conditions [5], [6]. Practicality does not establish effectiveness: subsequent studies must connect platform use with learning indicators and examine the quality of materials, activities, and assessments.

Engagement comprises behavioural, cognitive, affective, and social dimensions [26]. Progress dashboards should therefore provide actionable feedback on incomplete activities, unmastered concepts, personal goals, and next steps. Completion percentages alone cannot establish meaningful support for self-regulated learning.

Digital assessment requires academic integrity, transparent rubrics, equitable access, and feedback [12], [13]. AI may support reasoning or circumvent learning [27]. Educloud should specify permitted AI use, require disclosure of assistance, and support process-oriented rubrics, reflection, and revision logs.

Entrepreneurship education involves identifying problems, exploring opportunities, designing solutions, evaluating feasibility, and communicating value [19], [20]. Educloud connects these activities through profiling, teamwork, ideation, project development, and evaluation. Its embedded AI supports this experiential workflow through ideas and formative feedback.

The technical contribution is the orchestration of learner profiling, relational-context retrieval, constraint-based generation, validation, privacy protection, and tutor oversight within one LMS. PostgreSQL supplies structured learner and project data to the server-side Gemini service. Because this context already resides in relational records, direct database-grounded prompting avoids the complexity of embeddings, vector storage, and external semantic retrieval. Identifier removal, request pseudonyms, protected credentials, JSON and constraint checks, retry, and fallback govern output delivery. Educloud thus operationalises broader educational AI opportunities [16] within a specific Edupreneurship process without developing a new foundation model.

Technical integration and positive perceptions do not establish recommendation accuracy or educational effects. Outputs may contain unsuitable assumptions or weak feasibility judgments, so tutors retain final authority. Larger task-based studies should measure relevance, constraint compliance, idea quality, user reliance, and effects on project development.

Development should proceed through four priorities: stabilise registration, course creation, content access, submissions, quizzes, progress, and roles; strengthen tutor instructional scaffolding; turn analytics into actionable recommendations; and formalise pedagogical and ethical policies for AI and Edupreneurship.

Expert validation and small-group testing establish initial design feasibility and practicality. Larger field, quasi-experimental, or mixed-methods studies should follow. Pretest–posttest designs can assess learning; TAM, UTAUT, or e-learning success models can assess acceptance; surveys with platform logs can assess engagement.

Cronbach's alpha indicates internal consistency, while content validity, readability, response distributions, ceiling effects, and construct consistency require separate examination. With adequate samples, exploratory or confirmatory factor analysis or PLS-SEM may assess construct validity. Small initial samples favour descriptive evidence and qualitative comments over premature inference.

The three-expert and ten-user samples limit findings to initial feasibility and practicality. This R&D evaluation contributes an instrument structure, analytic categories, and reporting templates while distinguishing these claims from effectiveness. Broader studies should document participant characteristics and include tutors and students across courses or training programmes.

Subsequent evaluation should combine perceptions with logs of login frequency, access duration, opened materials, quiz completion, assignment submission, and course completion. Learning outcomes should be measured directly. Edupreneurship outcomes should include idea quality, market validation, prototype-course completeness, and communication of product value. Such evidence is necessary before claiming changes in learning or behaviour.

Table 13 links the findings and literature to development decisions and evaluation priorities that require retesting.

Table 13. Development implications and evaluation agenda for Educloud.

Aspect	Development implication	Next evaluation agenda
Instructional design	Strengthen templates for objectives, activities, rubrics, and feedback	Validation by pedagogy experts and tutor users
Usability	Simplify microcopy, navigation, and onboarding	Task-based usability testing and time-on-task measurement
Digital assessment	Add rubrics, AI-use declarations, and formative feedback	Academic integrity audit and task quality review
Learning analytics	Convert progress data into recommended actions	Log analysis and correlation with engagement
Edupreneurship	Add idea-validation flows and project documentation	Portfolio and entrepreneurship rubric assessment
AI governance	Ensure transparency, human oversight, and data security	AI ethics audit and data protection review

4. Conclusions

This study developed and initially evaluated Educloud, integrating cloud-based LMS functions, assessment, progress monitoring, and AI-supported Edupreneurship. Laravel and PostgreSQL support a server-side gemini-2.5-flash service through the Google Gemini Developer API. Database-grounded contextual prompting, minimisation, pseudonymisation, response validation, and tutor oversight connect AI assistance with learner profiles and entrepreneurial constraints. Three experts rated feasibility at 93.14% (M = 4.66; Aiken's V = 0.91), while ten users rated practicality at 89.36% (M = 4.47; Cronbach's alpha = 0.93). These results support initial feasibility and practicality, but do not establish recommendation accuracy or improvements in learning, competence, engagement, or project quality. Larger samples, repeated technical testing, platform-log analysis, AI-output evaluation, and experimental or mixed-methods studies are required.

Declarations

AI Usage Statement

OpenAI ChatGPT was used to assist with software development troubleshooting and manuscript language. Google Gemini was integrated into Educloud as a functional component of the developed learning platform, supporting context-aware business-idea recommendations and formative feedback within the Edupreneurship module. The authors reviewed the AI-assisted work and retain full responsibility for the research methodology, reported findings, interpretations, and conclusions.

Author Contributions

Arafah Husna: Conceptualization, methodology, software, investigation, data curation, formal analysis, validation, visualization, writing – original draft, and writing – review and editing; I Nyoman Sudana Degeng: Conceptualization, supervision, methodology, and writing – review and editing; Punaji Setyosari: Methodology, supervision, validation, and writing – review and editing; Dedi Kuswandi: Supervision, resources, validation, and writing – review and editing; Ahmad Fahmi: Software, validation, and writing – review and editing; M. Zainal Arifin: Software, data curation, validation, and writing – review and editing; Aripriharta: Technical supervision, methodology, validation, and writing – review and editing.

Funding Statement

This research received funding from the Institute for Research and Community Service of Universitas Negeri Malang (UM) for the Fiscal Year 2025, under Contract Number 24.2.443/UN32.14.1/LT/2025, through the Center of Excellence for Science and Technology Program (Program Unggulan IPTEKS).

Conflict of Interest Statement

The authors declare that they have no conflicts of interest related to the research and publication of this manuscript.

Ethical Clearance

This study involved three expert validators and ten participants in a small-group evaluation of the Educloud platform. Participation was voluntary, and informed consent was obtained before data collection. Participant information was treated confidentially, and the evaluation results were reported without personally identifiable information.

Data and Code Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to participant privacy and institutional data-sharing restrictions. The source code of the Educloud platform is not publicly available.

References

[1] O. B. Adedoyin and E. Soykan, "Covid-19 pandemic and online learning: the challenges and opportunities," *Interactive Learning Environments*, vol. 31, no. 2, pp. 863–875, Feb. 2023, doi: 10.1080/10494820.2020.1813180.

[2] S. Dhawan, "Online Learning: A Panacea in the Time of COVID-19 Crisis," *Journal of Educational Technology Systems*, vol. 49, no. 1, pp. 5–22, Sep. 2020, doi: 10.1177/0047239520934018.

[3] D. Al-Fraihat, M. Joy, R. Masa'deh, and J. Sinclair, "Evaluating E-learning systems success: An empirical study," *Computers in Human Behavior*, vol. 102, pp. 67–86, Jan. 2020, doi: 10.1016/j.chb.2019.08.004.

[4] G. Dash, S. Akmal, P. Mehta, and D. Chakraborty, "COVID-19 and E-Learning Adoption in Higher Education: A Multi-Group Analysis and Recommendation," *Sustainability*, vol. 14, no. 14, p. 8799, Jul. 2022, doi: 10.3390/su14148799.

[5] E.-J. Kim, J. J. Kim, and S.-H. Han, "Understanding Student Acceptance of Online Learning Systems in Higher Education: Application of Social Psychology Theories with Consideration of User Innovativeness," *Sustainability*, vol. 13, no. 2, p. 896, Jan. 2021, doi: 10.3390/su13020896.
[6] M. Rizun and A. Strzelecki, "Students' Acceptance of the COVID-19 Impact on Shifting Higher Education to Distance Learning in Poland," *IJERPH*, vol. 17, no. 18, p. 6468, Sep. 2020, doi: 10.3390/ijerph17186468.
[7] Tim Educloud, *Educloud – User Guide*. Educloud, 2025.
[8] OECD, *OECD Digital Education Outlook 2023: Towards an Effective Digital Education Ecosystem*. in OECD Digital Education Outlook. OECD Publishing, 2023. doi: 10.1787/c74f03de-en.
[9] UNESCO, *Global Education Monitoring Report 2023: Technology in Education – A Tool on Whose Terms?* Paris: UNESCO, 2023. [Online]. Available: https://www.unesco.org/gem-report/en/publication/technology
[10] F. Martin, T. Sun, and C. D. Westine, "A systematic review of research on online teaching and learning from 2009 to 2018," *Computers & Education*, vol. 159, p. 104009, Dec. 2020, doi: 10.1016/j.compedu.2020.104009.
[11] S. Simelane-Mnisi, "Effectiveness of LMS Digital Tools Used by the Academics to Foster Students' Engagement," *Education Sciences*, vol. 13, no. 10, p. 980, Sep. 2023, doi: 10.3390/educsci13100980.
[12] K. A. A. Gamage, E. K. D. Silva, and N. Gunawardhana, "Online Delivery and Assessment during COVID-19: Safeguarding Academic Integrity," *Education Sciences*, vol. 10, no. 11, p. 301, Oct. 2020, doi: 10.3390/educsci10110301.
[13] O. L. Holden, M. E. Norris, and V. A. Kuhlmeier, "Academic Integrity in Online Assessment: A Research Review," *Front. Educ.*, vol. 6, p. 639814, Jul. 2021, doi: 10.3389/feduc.2021.639814.
[14] E. Kasneci *et al.*, "ChatGPT for good? On opportunities and challenges of large language models for education," *Learning and Individual Differences*, vol. 103, p. 102274, Apr. 2023, doi: 10.1016/j.lindif.2023.102274.
[15] W. M. Lim, A. Gunasekara, J. L. Pallant, J. I. Pallant, and E. Pechenkina, "Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators," *The International Journal of Management Education*, vol. 21, no. 2, p. 100790, Jul. 2023, doi: 10.1016/j.ijme.2023.100790.
[16] European Commission, *Ethical Guidelines on the Use of Artificial Intelligence (AI) and Data in Teaching and Learning for Educators*. Luxembourg: Publications Office of the European Union, 2022. [Online]. Available: https://op.europa.eu/en/publication-detail/-/publication/d81a0d54-5348-11ed-92ed-01aa75ed71a1/language-en
[17] F. Ouyang and P. Jiao, "Artificial Intelligence in Education: The Three Paradigms," *Computers and Education: Artificial Intelligence*, vol. 2, p. 100020, Apr. 2021, doi: 10.1016/j.caeai.2021.100020.
[18] H. Crompton and D. Burke, "Artificial intelligence in higher education: the state of the field," *Int J Educ Technol High Educ*, vol. 20, no. 1, p. 22, Apr. 2023, doi: 10.1186/s41239-023-00392-8.
[19] V. Ratten, "Coronavirus (Covid-19) and the entrepreneurship education community," *Journal of Enterprising Communities: People and Places in the Global Economy*, vol. 14, no. 5, pp. 753–764, Dec. 2020, doi: 10.1108/JEC-06-2020-0121.
[20] V. Ratten and P. Jones, "Covid-19 and entrepreneurship education: Implications for advancing research and practice," *The International Journal of Management Education*, vol. 19, no. 1, p. 100432, Mar. 2021, doi: 10.1016/j.ijme.2020.100432.
[21] E. Ernawati, M. Dewi, L. Rosalina, F. Ferdian, and F. S. Andres, "An evaluation of e-learning of entrepreneurship course: Learning alternative during Covid-19 pandemic for university students," *Jurnal Penelitian dan Evaluasi Pendidikan*, vol. 26, no. 1, pp. 47–58, Jun. 2022, doi: 10.21831/pep.v26i1.44073.
[22] K. C. S. Lee, "Teaching Entrepreneurship Education (EE) Online During Covid-19 Pandemic: Lessons learned from a Participatory Action Research (PAR) in a Malaysian Public University," *Sage Open*, vol. 12, no. 1, p. 21582440221082126, Jan. 2022, doi: 10.1177/21582440221082126.
[23] D. Adriani, P. Lubis, and M. Triono, "Teaching Material Development of Educational Research Methodology with ADDIE Models," 2020, doi: 10.4108/eai.4-12-2019.2293793.
[24] C. Rapanta, L. Botturi, P. Goodyear, L. Guàrdia, and M. Koole, "Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity," *Postdigit Sci Educ*, vol. 2, no. 3, pp. 923–945, Oct. 2020, doi: 10.1007/s42438-020-00155-y.
[25] R. A. Rasheed, A. Kamsin, and N. A. Abdullah, "Challenges in the online component of blended learning: A systematic review," *Computers & Education*, vol. 144, p. 103701, Jan. 2020, doi: 10.1016/j.compedu.2019.103701.
[26] M. Bond, K. Buntins, S. Bedenlier, O. Zawacki-Richter, and M. Kerres, "Mapping research in student engagement and educational technology in higher education: a systematic evidence map," *Int J Educ Technol High Educ*, vol. 17, no. 1, p. 2, Dec. 2020, doi: 10.1186/s41239-019-0176-8.
[27] G. Andreou and P. Christani, "The Benefits and Limitations of the Use of Generative Artificial Intelligence Tools in the Acquisition of Productive Skills in English as a Foreign Language—A Systematic Analysis," *Applied Sciences*, vol. 15, no. 21, p. 11476, Oct. 2025, doi: 10.3390/app152111476.