Available on: https://jsshrs.ep-journals.org/ E-ISSN: 3051-3561, P-ISSN: 3051-3553

Journal of Social Science and Human Research Studies

Volume : 02 Issue : 11 November-2026

Developing Artificial Intelligence Assistants to Support University Students' Learning: Current Status, Potential, And Implementation Directions

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Published Date: November 25, 2026 **Article DOI: 10.65150/EP-jsshrs/V2E11/2026-32**

ABSTRACT: This paper examines the development of artificial intelligence (AI) assistants to support university students' learning amid the digital transformation of higher education and growing demand for self-directed study, interaction, and timely feedback. It addresses the roles of AI assistants, current lecturer practices, potential benefits for students, and the conditions required for responsible implementation. Drawing on a literature-based conceptual discussion and secondary analysis of findings from a 2026 institutional research project, the paper identifies a substantial gap between lecturers' general use of AI and the development of course-specific AI assistants. Of 142 valid lecturer survey responses, 98 reported having used AI, whereas only one lecturer reported creating an AI assistant for learners. Previously reported preliminary classroom comparisons show encouraging differences in cognitive test scores, timely task submission, and learning interactions; these outcomes do not establish the specific causal effects of AI assistants. The paper proposes a controlled eight-step development and deployment process grounded in verified course materials, lecturers' AI competence, academic integrity, data protection, student guidance, and ongoing evaluation.

KEYWORDS: AI assistants, higher education, learning support, digital transformation, responsible artificial intelligence

1. INTRODUCTION

Digital transformation is reshaping the organization of teaching and learning in higher education. Whereas digital technologies were previously used mainly for presentations, document storage, and classroom management, AI tools are increasingly involved in learning-material design, learning activities, assessment support, and personalized learning experiences. International research and guidance emphasize that AI raises not only technological opportunities but also new requirements concerning lecturers' competence, academic accountability, ethical practice, and students' capacity for independent learning [7–8]. University students increasingly require flexible support for self-study, revision, access to learning resources, questions outside classroom hours, and initial feedback. AI assistants may help address this need. Unlike lecturers' use of AI solely for lesson preparation, presentation design, or test-question development, an AI assistant is intended to provide a more continuous and interactive channel of learning support. It can facilitate question answering, practice, resource recommendations, and self-assessment, while lecturers retain responsibility for academic oversight, pedagogical guidance, and evaluation of learning outcomes. However, the development of university AI assistants cannot rely solely on the availability of general-purpose tools. Without vetted course materials, explicit design procedures, reliable oversight of generated responses, and data-protection safeguards, AI assistants may produce inaccurate information, weaken students' independent thinking, or create privacy risks. Findings from the institutional research project entitled "Research on the Application of Selected AI Tools in Teaching at Hanoi Industrial and Trade University" indicate that lecturers have begun to use AI in several teaching activities, but the creation of assistants specifically designed for student learning remains uncommon [6]. Against this background, this paper clarifies the theoretical basis of AI assistants in higher education, analyzes lecturers' existing use of AI to support learners, identifies potential student-learning benefits, and proposes directions for developing and implementing AI assistants effectively, safely, and responsibly.

The paper further distinguishes three levels of evidence: survey descriptions of lecturers' reported practices; preliminary comparisons of AI-supported and non-AI-supported lessons reported in the underlying institutional project; and the author's proposed design and governance recommendations. Keeping these categories separate is necessary because observed use of general AI tools cannot be treated as observed deployment of course-specific assistants. Consequently, the proposed implementation process should be read as a testable design proposition rather than an evaluated intervention.

2. RESEARCH CONTENT

2.1. AI assistants in higher education

In higher education, an AI assistant may be understood as an intelligent tool or system capable of interacting with users through natural language to answer course-related questions, recommend learning resources, guide assignments, support revision, provide preliminary feedback, and partially personalize learning. Technologically, such assistants generally draw on natural language processing, machine learning, and generative

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AI. Pedagogically, their value lies not in answering in place of students but in offering additional opportunities for scaffolding, inquiry, and feedback that support active learning.

AI assistants can serve students in a wide range of situations. When learners find a concept difficult, an assistant can restate an explanation more simply or provide an illustrative example. During revision, it may suggest questions, exercises, or application scenarios. When students undertake an assignment, it can clarify instructions, suggest steps, or facilitate self-checking before submission. These functions are consistent with personalized learning and the extension of academic support beyond scheduled class hours [1, 9].

For lecturers, an AI assistant may reduce repetitive questions, facilitate preliminary feedback, and generate information that helps identify student difficulties. Nevertheless, lecturers' roles shift toward designing learning activities, selecting reliable resources, checking response quality, guiding responsible student use, and undertaking higher-level assessment. The UNESCO AI competency framework for teachers similarly emphasizes human-centered thinking, AI ethics, AI-supported pedagogy, and continuing professional development [7].

A distinction should therefore be made between an AI assistant and isolated uses of AI in teaching. When a lecturer uses AI to prepare questions, slides, or lesson suggestions, the technology primarily supports instructional preparation. A learner-facing assistant, by contrast, requires explicit learning objectives, a defined scope of knowledge, response rules, usage boundaries, and quality-control mechanisms. Developing an AI assistant is thus a pedagogical design activity rather than merely a technical operation.

From an instructional-design perspective, the intended interaction should be linked to a demonstrable learning outcome. For example, a revision assistant may invite students to explain a concept in their own words, provide a relevant counterexample, and reflect on why a proposed answer is incomplete. This constitutes formative scaffolding; supplying a finished answer for an assessed assignment would serve a different and potentially inappropriate purpose. In keeping with the technological pedagogical content knowledge perspective [3], lecturers should determine which tasks benefit from conversational support and which must remain under direct supervision before selecting a platform.

A further distinction concerns response grounding. An assistant configured around an approved syllabus, lecture notes, assessment criteria, and reading list is better positioned to address course-specific questions than a general-purpose conversational tool with no defined documentary scope. Nevertheless, supplying sources does not eliminate fabrication, omissions, or misleading citations. An academically responsible design should encourage the assistant to identify source boundaries, acknowledge uncertainty, refer unresolved questions to lecturers, and avoid presenting generated responses as authoritative course policy [2], [7].

Table 1. Functions of AI assistants in supporting university students' learning

Function	Description	Benefits for students	Lecturer oversight
Academic question answering	Answers frequently asked questions about course content, learning tasks, or lesson requirements.	Provides an additional support channel outside class.	Define question scope and verify model answers.
Learning-resource recommendations	Suggests relevant readings, examples, videos, and reference materials.	Supports broader access to resources and guided self-study.	Select reliable sources and exclude unsuitable resources.
Revision support	Generates review questions, practice exercises, and application scenarios.	Supports knowledge consolidation at an individual pace.	Review items and ensure alignment with learning outcomes.
Preliminary feedback	Suggests revisions and identifies unclear or incomplete elements of student work.	Enables earlier feedback before submission.	Clarify that AI feedback is advisory only.
Learning personalization	Adjusts suggestions to a student's understanding, questions, or needs.	Improves access to appropriately pitched material.	Monitor overreliance and encourage independent thinking.
Task guidance	Restates instructions, proposes work sequences, and helps plan tasks.	Reduces uncertainty when starting assignments.	Design clear tasks and define permitted AI assistance.

Source: Author's synthesis.

As Table 1 indicates, AI assistants can support multiple stages of learning, from accessing knowledge and revising content to completing tasks and receiving preliminary feedback. However, each function requires lecturer oversight. AI may generate inaccurate or contextually inappropriate responses, and unguided use may encourage dependence. AI assistants are therefore most valuable as pedagogical support tools rather than substitutes for lecturers.

2.2. Data sources and analytical approach

This article is a conceptual and secondary-data analysis rather than a new institutional survey or controlled trial. Its empirical descriptions are drawn from the 2026 institutional research project led by Tran Thi Ngat [6], while the arguments concerning pedagogical design, student agency, and responsible use are informed by the published literature and guidance listed in the references [1]–[4], [7]–[9]. The secondary data are used for contextual diagnosis: they indicate the extent of AI use among responding lecturers and provide preliminary indicators from AI-supported teaching activities. They do not permit estimates of the independent effect of a dedicated AI assistant.

The analytical procedure consists of four linked tasks. First, reported lecturer practices are classified by general AI adoption, preparatory uses, and learner-facing assistant development. Second, the available survey counts and interview themes are interpreted within their original denominators and limitations. Third, the preliminary classroom indicators are discussed as exploratory comparisons without attributing differences to a single component. Finally, these findings are mapped to practical requirements for the design, quality assurance, ethical governance, and

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evaluation of future student-learning assistants. No additional participants, numerical findings, statistical significance tests, or effect sizes are introduced in this paper.

2.3. Current use of ai assistants among lecturers

Survey results from the institutional scientific research project "Research on the Application of Selected AI Tools in Teaching at Hanoi Industrial and Trade University", led by Tran Thi Ngat (2026), indicate that AI has begun to be used in teaching at the university. Among 142 valid survey responses, 98 lecturers (approximately 69%) reported using at least one AI tool. Usage was concentrated primarily on preparing instructional content and lesson plans. More deeply integrated activities, including grading, sophisticated interactive-material development, and creating learner-facing AI assistants, remained uncommon [6].

All 98 lecturers who had used AI reported employing it for content searches or lesson planning. Lower participation was recorded for slide design, image generation, infographics, mind maps, text-to-video conversion, lesson-overview videos, and educational games. Notably, only one lecturer used AI for grading and only one reported creating an AI assistant for learners, corresponding to approximately 1.0% of AI users in each case [6]. These findings suggest a considerable gap between familiarity with AI tools and their integration into sustained learning-support systems.

Regarding AI assistant development specifically, the survey recorded one lecturer using ChatGPT Plus, with no reported cases using Gemini or another AI tool for that purpose. The self-reported proficiency score for creating AI assistants was 3.0, with the sole respondent selecting level 3. This result represents only one individual and cannot be generalized to the lecturer population [6].

Table 2. Lecturer use of AI for developing student-learning assistants

Survey item	Research-project finding	Interpretation	Implications for AI assistants
Use of at least one AI tool in teaching	98/142 lecturers (approximately 69%).	Initial uptake of AI in teaching.	Basis for differentiated training.
AI use for content search/lesson planning	98/98 AI users (100%).	Most use concerns content preparation.	Move from isolated tools to pedagogically integrated workflows.
AI assistants for learners	1/98 AI users (1.0%).	Assistant development is very uncommon.	Provide detailed guidance, process templates, and advanced training.
Tools used to develop assistants	ChatGPT Plus: 1; Gemini: 0; other tools: 0.	Limited tool variety and supporting ecosystem.	Select appropriate tools with safeguards for data and materials.
Assistant-development proficiency	Mean: 3.0; 100% of relevant respondents at level 3 (n=1).	One-person result; not generalizable.	Repeat survey after training and pilots.
Factors identified in interviews	Prompt design: 8/10; awareness of AI roles/limits: 7/10; pedagogical integration difficulties: 6/10.	Barriers extend beyond tool access.	Combine technical, pedagogical, and ethical training.

Source: Compiled from the research project led by Tran Thi Ngat (2026) [6].

Table 2 reveals a two-sided picture. While a substantial proportion of lecturers have encountered AI, the development of learner-facing assistants is still exceptionally limited. This difference reflects not only access to tools but also skills in designing learning tasks, organizing and validating course materials, crafting prompts, controlling AI responses, and confidently embedding AI in teaching practices. These findings motivate the implementation directions proposed below.

The distinction between 98 lecturers using AI and one lecturer reporting assistant development is substantively important, but the figures should not be interpreted as proof that the other respondents lack interest or capability. The survey measures reported practices at the time of data collection; it does not establish why each lecturer had not designed an assistant. Plausible implementation barriers include the time required to curate learning materials, uncertainty about permitted uses, limited confidence in response accuracy, and insufficient technical support. These are interpretive possibilities to be evaluated in subsequent research, not findings that can be assigned individual frequencies from the existing survey.

The interview information adds context without providing a statistically representative estimate of barriers across all lecturers. For example, the reported emphasis on prompt design in eight of ten interviews suggests a practical training need in the interviewed group; it does not justify claiming that an equivalent proportion of all faculty face the same obstacle. Future inquiry would benefit from distinguishing perceived usefulness, frequency of use, competence in checking generated answers, and willingness to maintain a course-specific assistant. Such measures would make it possible to investigate whether adoption barriers arise primarily from knowledge, governance, technical feasibility, or workload.

2.3. Potential benefits for students' learning

Preliminary experimental findings from the 2026 institutional project led by Tran Thi Ngat are reused in this paper to discuss the potential of AI-supported learning. The mean cognitive test score was 8.15 in the AI-supported lesson and 7.25 in the lesson without AI. Timely submission of learning worksheets reached 93.75% in the AI-supported lesson, compared with 65.63% without AI. Average learning questions or exchanges increased from 0.031 to 1.625 per student per lesson [6]. These differences suggest promising opportunities for AI-supported learning but do not establish the long-term effects of AI assistants specifically.

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Table 3. Preliminary indicators of potential benefits from AI-supported learning

Evaluation area	Indicator	AI-supported lesson	Lesson without AI	Difference	Interpretation
Learning outcomes	Mean cognitive test score	8.15	7.25	+0.90	Encouraging initial difference.
Task completion	On-time worksheet submission	93.75%	65.63%	+28.12 percentage points	Potential support for timely completion.
Learning interaction	Average questions/exchanges per student per lesson	1.625	0.031	+1.594	Potential to encourage interaction.

Source: Compiled from the research project led by Tran Thi Ngat (2026) [6].

The differences in Table 3 suggest that AI-supported activities may contribute to student engagement and task completion. These indicators matter because university learning is reflected not only in test results but also in participation, independence, and responsible completion of learning tasks. Nevertheless, the underlying experiment had a narrow scope, did not include extensive statistical hypothesis testing, and did not measure long-term effects. Accordingly, these results should be treated as preliminary indications of implementation potential, not findings generalizable to every course or student group. In particular, the comparisons concern AI-supported lessons rather than an independently evaluated course-specific AI assistant.

Three considerations help interpret the preliminary comparisons. First, the cognitive test score is an outcome indicator, whereas task-submission timeliness and the number of learning exchanges describe different aspects of student participation. They should not be aggregated into one overall measure of learning improvement. Second, observed differences may be influenced by lesson content, teaching arrangements, student preparation, course difficulty, or other contextual factors not isolated in the available summary. Third, because the intervention was AI-supported teaching rather than a separately evaluated learning assistant, the findings cannot establish that an assistant would reproduce the same outcomes. The data are therefore useful for motivating a pilot study, not for calculating an assistant-specific effectiveness claim.

A future evaluation should specify, before implementation, the population, course context, assistant functions, intended learning outcomes, and a comparison condition. Where feasible, comparable course sections or a carefully documented pre–post design could be used, with attention to baseline differences and ethical access to learning support. Outcomes might include performance on aligned assessments, time needed to resolve a learning difficulty, quality of independent explanations, completion of practice tasks, and frequency of lecturer escalation. Reporting sample sizes, missing observations, dispersion, and uncertainty intervals would make results easier to interpret. A qualitative component could document why learners accept, reject, or misuse the assistant's responses.

2.4. Conditions for implementing ai assistants at universities

Implementing AI assistants in universities should be understood as technology-enabled pedagogical innovation, rather than simply introducing another tool into class. Because lecturers currently use AI primarily for preparation, a transition toward student-facing assistants demands more rigorous arrangements for learning materials, professional competence, infrastructure, policy, and performance evaluation. The relevant conditions are summarized in Table 4.

Table 4. Conditions for implementing student-learning AI assistants in universities

Condition	Required preparations	Risks if unmet	Recommended direction
AI policies and usage rules	Define scope, academic responsibilities, citation requirements, and data controls.	AI misuse; lack of lecturer governance guidance.	Issue university-level and course-specific guidance.
Digital learning materials and input data	Prepare syllabi, lectures, readings, FAQs, item banks, and rubrics.	Incorrect, off-topic, or excessively broad answers.	Standardize learning materials before deployment.
Lecturers' AI competence	Prompt design, output verification, learning-scenario design, and evaluation.	Fragmented use and weak pedagogical impact.	Provide scenario- and deliverable-based training.
Student AI-use guidance	Teach questioning, verification, citation, and individual responsibility.	Overdependence, copying, weakened independent thinking.	Integrate responsible AI use at the start of each course.
Data protection and privacy	Restrict personal data, grades, and sensitive information in public AI systems.	Data leakage and privacy violations.	Prefer tools with account, data, and access controls.
Post-implementation evaluation	Track learning outcomes, interaction, task completion, and student feedback.	Effects cannot be evaluated or improvements targeted.	Conduct regular quantitative and qualitative evaluations.

Source: Author's proposal based on the research findings.

As Table 4 shows, effective deployment is not merely a technical matter. AI assistants intersect with academic governance, instructional design, lecturers' competence, students' learning behavior, and data protection. Uncoordinated experimentation may lead to uneven and difficult-to-control outcomes, whereas an explicit process can position AI assistants as a useful element of a university's digital learning ecosystem.

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2.5. Design, validation, and monitoring protocol

The proposed eight-step sequence in Figure 1 can be operationalized through explicit review checkpoints. At the initial design stage, a course team should state what the assistant is allowed to do—for example, explain course terminology, generate non-graded practice items, or guide students toward relevant readings—and what it must not do, such as determine final grades, disclose another student's work, or provide unsupported institutional advice. The team should then compile an approved source set, record its version, remove unnecessary personal information, and define ownership of future updates. These preparations are essential because course content and assessment requirements change over time.

Before students are given access, a small, deliberately varied set of test prompts should cover factual questions, misconceptions, ambiguous requests, requests beyond the prescribed syllabus, and attempts to obtain restricted assessment answers. Lecturers can evaluate whether responses are consistent with approved materials, pedagogically appropriate, transparent about uncertainty, and capable of directing students to human support when necessary. Errors should be logged by category and severity, with documented corrective actions. Such testing does not certify that all outputs will be accurate; it establishes a repeatable procedure for detecting and managing foreseeable problems.

During a pilot, monitoring should consider both educational value and operational burden. A high number of chatbot interactions is not by itself evidence of learning, especially when repeated questions reflect confusion or unreliable responses. Useful indicators include resolved-versus-escalated queries, factual correction rates in reviewed samples, student-reported clarity, time spent maintaining the source base, and any adverse incidents involving privacy or inappropriate academic assistance. The decision to scale up should therefore be conditional on acceptable accuracy, demonstrable educational usefulness, manageable maintenance costs, and the continuing ability of lecturers to intervene.

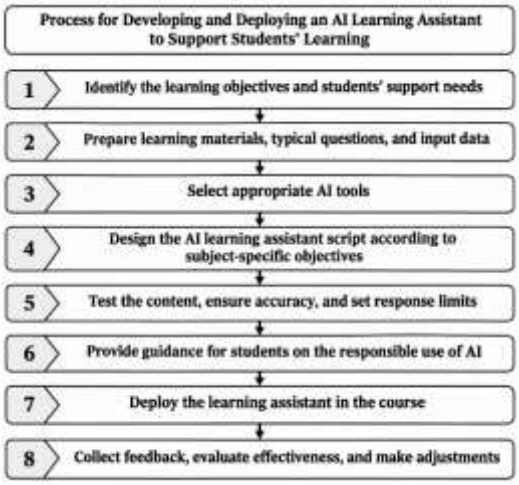

Figure 1. Proposed process for developing and implementing AI learning assistants
Source: Author's proposal based on the research findings.

Figure 1 outlines a controlled implementation process. Crucially, development begins with course objectives and student support needs rather than the tool itself. Lecturers then standardize materials, select an appropriate platform, design interactions, and test responses before deployment. Guidance on responsible AI use is particularly important because assistant effectiveness depends partly on how students formulate questions, verify feedback, and use generated information. Finally, collecting feedback and making improvements helps prevent the assistant from becoming a static product detached from evolving teaching needs.

The sequence also requires a clear allocation of responsibilities. Lecturers remain accountable for course content and educational decisions; an authorized technical team manages access and system configuration; students are informed about acceptable use and the limits of automated responses; and academic administrators establish reporting and review procedures. This division reduces ambiguity when a generated answer is disputed. Consistent with UNESCO's human-centered guidance [2], [7], [8], the assistant should augment feedback and inquiry without transferring responsibility for consequential academic judgments to an automated system.

3. CONCLUSION AND RECOMMENDATIONS

3.1. Conclusions

AI assistants represent a promising application of artificial intelligence in higher education, particularly as institutions accelerate digital transformation and expand support for self-directed learning. Evidence from the institutional research project at Hanoi Industrial and Trade University shows that lecturers have begun using AI, particularly for content preparation and lesson planning. However, the development of course-specific AI assistants remains limited. This reflects the gap between basic AI tool use and the integration of AI into pedagogically structured learning-support systems.

Preliminary experimental findings reused from the 2026 project led by Tran Thi Ngat indicate encouraging differences in cognitive test performance, on-time task completion, and learning interactions during AI-supported lessons. However, the experiment was limited in scope and does not justify broad generalization or causal claims about AI assistants in particular. AI assistants cannot replace lecturers' academic responsibilities; their value depends on careful design, oversight, and use within a clear teaching and learning process.

The central contribution of this article is to connect an observed institutional adoption gap to a pedagogically controlled development process. The available descriptive evidence supports the need for differentiated capacity building, but it does not establish the effectiveness of the proposed process. Further validation should therefore focus on the usability and accuracy of course-grounded responses, the effects on independent

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learning, the distribution of benefits among students with different levels of digital competence, and the resources required for sustainable operation.

3.2. Recommendations

Universities should develop coordinated guidelines for AI assistant use, including academic responsibilities, data protection, appropriate citation, and acceptable use. Course teams should curate reliable syllabi, lecture materials, questions, and assessment rubrics before deployment. Lecturers should receive practical training in prompt engineering, pedagogical interaction design, response verification, and evaluation methods. Students should be instructed to check AI-generated information critically, protect personal information, acknowledge AI assistance where required, and maintain academic independence.

Initial deployments should be piloted in clearly defined courses, followed by regular evaluation using learning-outcome indicators, interaction measures, task completion, and qualitative feedback. Future research should extend pilots across disciplines and larger student groups, assess long-term effects on learning outcomes and autonomous learning, and investigate academic integrity and responsible use under more rigorous research designs.

A staged institutional approach is preferable to immediate campus-wide deployment. An initial pilot can be confined to a clearly defined course and an approved set of low-risk learning-support functions. The course team should document baseline learner needs and technical constraints; test sample responses before release; brief students about citation, privacy, and independent work; and periodically review de-identified usage patterns together with targeted feedback. Decisions on continuation, revision, or expansion should follow documented performance criteria rather than usage volume alone.

Future investigations should also separate the contribution of the AI assistant from that of broader AI-assisted teaching, including changes in lesson materials, lecturer engagement, and assessment design. Designs with appropriate comparison groups, sufficiently described samples, and transparent outcome definitions would permit more informative estimates. Where controlled comparisons are impractical, longitudinal case studies with audit trails and explicit limitations can still clarify feasibility, implementation fidelity, and unintended consequences. Such studies should report negative findings and maintenance costs as well as potential educational gains.

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