Needs Analysis for Flipped Classroom Integration Using Interactive H5P Modules in Herbal Pharmacology Learning

Kelik Widjonarko[1*]; Cecep Kustandi[2]; Maria Paristiowati[3]

[1,2]*Educational Technology, Universitas Negeri Jakarta, Indonesia*
[3]*Chemistry Education, Universitas Negeri Jakarta, Indonesia*
[1*]*Corresponding Email: kelikwidjonarko@gmail.com*

Article History:
Received: Nov 05, 2025
Revised: Jan 26, 2026
Accepted: Mar 04, 2026
Online First: Mar 25, 2026

Keywords:
Flipped Classroom,
Interactive H5P Module,
Learning Needs,
Needs Analysis,
Student Engagement.

Kata Kunci:
Analisis kebutuhan,
Flipped Classroom,
Kebutuhan Pembelajaran,
Keterlibatan Mahasiswa,
Modul Interaktif H5P

How to cite:
Widjonarko, K., Kustandi, C., & Paristiowati, M. (2026). Needs Analysis for Flipped Classroom Integration Using Interactive H5P Modules in Herbal Pharmacology Learning. *Edunesia : Jurnal Ilmiah Pendidikan, 7*(2), 997-1014.

Abstract: This study conducted a needs analysis to inform the development of herbal pharmacology instruction using a flipped-classroom approach supported by interactive H5P (Hypertext Markup Language 5) modules at the Dharma Usada Study Program, Institut Nalanda. Employing a qualitative descriptive design, data were collected through structured classroom observations, semi-structured interviews with the course lecturer, and questionnaires administered to twenty-one students. Data were analyzed using descriptive qualitative methods and percentage calculations to identify instructional gaps and learner needs. Findings show learning remains lecture-dominant (78%) and reliant on presentation slides (91%), contributing to limited interaction and low student Engagement. Most students expressed readiness for technology-enhanced learning: 94% indicated strong interest in a flipped-classroom model supported by interactive H5P to promote autonomous learning and deeper conceptual understanding. Based on these results, the study recommends designing structured H5P modules featuring interactive videos, formative quizzes, and immediate feedback. This needs analysis provides an empirical basis for development, expert validation and pilot testing.

Abstrak: Penelitian ini melakukan analisis kebutuhan untuk pengembangan pembelajaran farmakologi herbal menggunakan pendekatan flipped classroom berbantuan modul interaktif H5P pada Program Studi Dharma Usada Institut Nalanda. Penelitian ini menggunakan desain deskriptif kualitatif sebagai studi analisis kebutuhan untuk mengidentifikasi kesenjangan antara praktik pembelajaran saat ini dan kebutuhan pembelajaran yang lebih interaktif yang relevan dan secara terukur. Data dikumpulkan melalui observasi kelas terstruktur, wawancara semi-terstruktur dengan dosen, serta angket kepada 21 mahasiswa. Data dianalisis menggunakan teknik deskriptif kualitatif dan perhitungan persentase untuk menggambarkan kondisi pembelajaran secara komprehensif. Hasil menunjukkan pembelajaran masih didominasi metode ceramah (78%) dan penggunaan slide presentasi (91%), sehingga interaktivitas dan keterlibatan mahasiswa relatif rendah. Sebanyak 94% mahasiswa menyatakan minat tinggi terhadap penerapan flipped classroom berbantuan modul interaktif H5P untuk meningkatkan kemandirian belajar dan pemahaman konsep. Temuan ini menegaskan kebutuhan perancangan modul H5P terstruktur yang memuat video interaktif, kuis formatif, dan umpan balik langsung sebagai dasar bagi pengembangan, validasi ahli, dan uji coba terbatas bahan ajar.

https://doi.org/10.51276/edu.v7i2.1572

A. Introduction

The acceleration of digital learning since the pandemic has driven higher education institutions to explore more effective learning approaches that are oriented toward student learning outcomes (Divjak et al., 2022). Within this context, the integration of educational technology and the implementation of active learning methods have emerged as urgent needs to enhance student Engagement and strengthen learning outcomes (Deng & Yang, 2025). A systematic review of 21st-century digital learning reveals that, despite the rapid advancement of educational technologies, pedagogical challenges remain the primary barrier to effective implementation (Zou et al., 2025). This pedagogical crisis has arisen from the transition from face-to-face instruction to online learning, in which lecturers are required to adapt to new methods that maintain active student participation in virtual learning environments (Sembiring, 2021).

The transformation of online learning in higher education is often limited to transferring traditional face-to-face teaching methods into digital platforms without sufficient renewal of the underlying pedagogical approach. Ideally, the transition to online learning should be accompanied by a comprehensive integration of three essential components of the learning process: pedagogy, content, and technology (Judijanto et al., 2024). Conventional teaching methods, dominated by lectures and passive learning, can no longer meet the needs of the digital generation—students accustomed to dynamic, participatory, and interactive learning environments (Al-Karadsheh et al., 2025; Sareen & Mandal, 2024; Shi et al., 2024). The limitations of conventional learning become evident when students exhibit low Engagement, underdeveloped critical thinking skills, and difficulty applying theoretical knowledge to practical contexts (Dsouza et al., 2025; Santilli et al., 2025).

Various pedagogical barriers in the implementation of online learning, according to a qualitative study involving 23 lecturers at Vietnamese University, include a lack of preparedness in designing lesson plans, limited interaction during the delivery of course materials, ineffective teaching methods and learning activities, passive student participation, as well as disruptions and difficulties in managing virtual classrooms effectively (Tran et al., 2023). In response to these pedagogical challenges, there is a pressing need to transform higher education learning models from teacher-centred to more interactive, student-centred approaches (Falasi, 2024; Panakaje et al., 2024). In a student-centred curriculum, learners are no longer merely recipients of information; they are expected to participate in the learning process actively. One instructional model considered capable of realizing this paradigm is the flipped classroom.

The flipped classroom has emerged as an innovative pedagogical approach designed to address various challenges inherent in online learning. This model reverses the traditional learning paradigm, wherein students first study the learning materials independently outside the classroom, while face-to-face sessions are devoted to interactive activities such as discussions, concept applications, and in-depth exploration of topics (Haziki et al., 2025; Mazlan et al., 2025; Pablo-Lerchundi et al., 2023). Numerous studies have demonstrated that

https://doi.org/10.51276/edu.v7i2.1572

implementing the flipped classroom can enhance learning motivation, promote active student Engagement, and improve higher-order thinking skills compared to conventional teaching methods (Molina-Torres, 2024; Shi et al., 2024). Meta-analytic findings further substantiate these results, indicating that the flipped classroom model significantly enhances academic achievement among university students (Haziki et al., 2025). Other research likewise highlights that this model can effectively increase students' motivation to learn, cultivate critical thinking abilities, and offer a more individualised and adaptable learning experience (Liu et al., 2024).

Implementing the flipped classroom requires appropriate learning media, particularly digital and interactive tools such as videos, presentations, and online learning platforms. Research by Kakish et al (2025) demonstrated that interactive H5P modules are well-suited for flipped classroom learning due to their usability and flexibility. H5P enables instructors to create interactive videos with embedded quizzes, interactive presentations, and simulation-based learning activities (Jacob & Centofanti, 2023; Sharmin et al., 2024). Empirical evidence suggests that H5P enhances cognitive and affective Engagement through dynamic content presentation and interactive assessments (Pablo-Lerchundi et al., 2023; Sinnayah et al., 2021) and has been shown to improve learning outcomes and motivation (Kakish et al., 2025; Rahmi et al., 2024; Sharmin et al., 2025).

The researcher conducted a preliminary observation in the herbal pharmacology course of the Dharma Usada study program at Institut Nalanda. The results indicated that the learning process was conducted entirely through synchronous online sessions with conventional lecture methods. The learning media used were limited to static presentation slides, which did not fully support engaging learning experiences or foster a deep understanding of the material. These findings suggest the need for a pedagogical transformation supported by interactive digital learning media.

Although the flipped classroom model and H5P interactive modules have been widely investigated across disciplines, few studies specifically analyse and examine the actual learning needs and readiness for implementing an H5P-assisted flipped classroom in the context of herbal pharmacology education. Previous studies predominantly focus on measuring effectiveness after implementation, rather than conducting a comprehensive needs analysis grounded in empirical field data such as classroom observations, interviews, and student surveys. Furthermore, research addressing the specific characteristics of traditional health science programs, particularly the Dharma Usada study program, remains scarce. Therefore, there is a clear research gap regarding context-based needs assessment as a foundational step in designing a flipped classroom model supported by interactive H5P modules for herbal pharmacology learning.

The novelty of this study lies in three main aspects. First, it situates the flipped classroom and H5P integration within the unique academic context of herbal pharmacology in the Dharma Usada study program. This field combines theoretical pharmacological concepts with traditional herbal knowledge. Second, this study integrates interactive H5P modules specifically as preparatory learning media in a flipped classroom framework

https://doi.org/10.51276/edu.v7i2.1572

tailored to the characteristics of herbal pharmacology content. Third, rather than directly testing effectiveness, this research emphasises a systematic needs analysis to generate evidence-based design requirements for developing a contextually relevant flipped classroom model assisted by H5P modules.

Given the identified research gap and novelty, this study seeks to examine several key aspects of the implementation of technology-enhanced learning in herbal pharmacology education. Specifically, the study investigates the main challenges encountered in the current herbal pharmacology learning process within the Dharma Usada Study Program (RQ1) and the level of students' readiness to engage in technology-based and flipped classroom learning environments (RQ2). Furthermore, the study explores how a flipped classroom model can be pedagogically designed to address the identified learning problems (RQ3) and identifies the interactive H5P module features required to support effective implementation in herbal pharmacology instruction (RQ4). Accordingly, the objective of this study is to systematically analyse students' learning needs, technological readiness, and perceptions as a foundation for designing a flipped classroom model supported by interactive H5P modules in the herbal pharmacology course at Institut Nalanda. Through this analysis, the study contributes empirical evidence regarding instructional needs. It proposes a pedagogically grounded framework for integrating flipped classroom strategies and interactive H5P modules to enhance Engagement, learning autonomy, and conceptual understanding in herbal pharmacology education.

B. Method

Research Design

This study employed a qualitative descriptive needs analysis design. This approach was selected because it aligns with the research objective—to provide an in-depth portrayal of existing learning conditions and to comprehensively explore students' subjective perspectives (Dewi et al., 2023). This study was selected to systematically identify gaps between existing instructional practices and the expected characteristics of a flipped classroom model assisted by interactive H5P modules. The qualitative descriptive approach enables an in-depth exploration of participants' perspectives and contextual learning conditions, which serve as the empirical foundation for model development. The research was conducted at Institut Nalanda, located in East Jakarta, Indonesia, during the 2024/2025 academic year.

Participants

The study population consisted of all students enrolled in the Dharma Usada Study Program at Institut Nalanda. The sample comprised 21 students enrolled in the Herbal Pharmacology course during the 2024/2025 academic year. Purposive sampling was applied using the following inclusion criteria: (1) previously attended the Herbal Pharmacology course, (2) regular attendance in class sessions, and (3) willingness to participate voluntarily in the study. The 21 students represent the entire cohort taking the

https://doi.org/10.51276/edu.v7i2.1572

course, thereby allowing comprehensive capture of learner needs within the study context. In addition, one lecturer responsible for teaching Herbal Pharmacology served as a key informant, providing in-depth insights into instructional practices and development needs.

Instrument Development

Data were collected through observation, interviews, and questionnaires. The questionnaire consisted of 14 items designed to measure students' learning needs in Herbal Pharmacology. The instrument was developed based on a literature review concerning flipped classroom pedagogy, digital learning integration, and herbal pharmacology instruction. These theoretical foundations were synthesised into seven aspects: (1) material comprehension, (2) learning methods, (3) instructional time allocation, (4) learning media, (5) need for practice exercises, (6) availability of digital device support, and (7) preferred learning model. To ensure content validity, the questionnaire draft was evaluated by two experts—one expert in instructional design and one expert in herbal pharmacology education. Revisions were made based on suggestions related to clarity, relevance, and alignment with flipped classroom principles. A limited try-out was conducted with students outside the research sample to evaluate readability and internal consistency. Reliability testing using Cronbach's Alpha produced a coefficient above 0.70, indicating acceptable reliability. An observation guideline and interview protocol were also developed to ensure systematic and consistent data collection.

Data Analysis Procedure

Data analysis in this study was conducted systematically according to the type of data collected, as follows:

1. Observation Analysis
   Observation data were analysed using a structured thematic summary procedure. The analysis involved four stages: (1) organising field notes chronologically; (2) reducing data by selecting segments relevant to instructional methods, student Engagement, media use, and time allocation; (3) categorising recurring patterns; and (4) synthesising categories into thematic summaries describing the existing learning conditions. The resulting themes reflected instructional dominance patterns, interaction dynamics, and gaps in technological integration in Herbal Pharmacology learning.
2. Interview Analysis
   Interview data were transcribed verbatim prior to analysis. The analysis employed open coding procedures consisting of: (1) initial line-by-line coding to identify meaningful statements; (2) grouping similar codes into conceptual categories; and (3) synthesising categories into broader themes representing instructional challenges, student learning difficulties, and perceived needs for flipped classroom implementation. To enhance analytical rigour, codes were continuously compared across data segments using a constant comparative technique. Emerging themes were refined until conceptual saturation was achieved.

https://doi.org/10.51276/edu.v7i2.1572

3. Questionnaire Analysis
   Questionnaire data were analysed quantitatively using descriptive statistics. Each item response was tabulated, and frequencies and percentages were calculated to determine response distribution.

The interpretation of learning needs followed these criteria: High priority need ≥ 75%, Moderate need 50–74%, Low need < 50%. The descriptive findings were then interpreted in relation to flipped classroom characteristics to identify specific areas requiring instructional redesign.

Triangulation was used to ensure the credibility and confirmability of the findings. Findings were considered valid when convergence appeared across at least two data sources. Divergent findings were analysed interpretively to provide a comprehensive representation of learning needs. The triangulation process involved cross-checking data obtained from observation, interview, and questionnaire results through the following steps:

1. Comparing observation findings with lecturer interview responses to identify consistency in reported instructional practices.
2. Comparing student questionnaire results with observation data to verify alignment between perceived and observed classroom conditions.
3. Examining discrepancies across data sources and re-analysing related segments to obtain contextual explanations.

The research Flow Diagram followed a structured needs analysis model as illustrated below (see Figure 1):

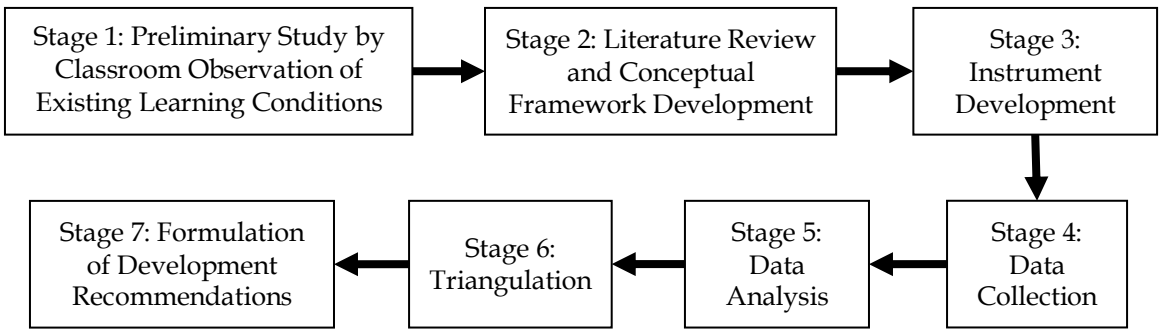

Figure 1. Research Flow Diagram

C. Result

The researcher's observations in the herbal pharmacology course revealed that the lecturer had not yet implemented the flipped classroom model and still relied heavily on presentation slides as the primary instructional resource. The learning activities were predominantly characterised by conventional lecture methods that tended to be teacher-centred. The lecturer rarely applied diverse learning models and provided limited opportunities for two-way interaction between the lecturer and students. The lecturer had

https://doi.org/10.51276/edu.v7i2.1572

not yet adopted structured strategies to facilitate independent learning prior to class sessions.

Following the observation, the researcher conducted interviews with the lecturer to obtain more in-depth information. Prior to the interview, the researcher explained the concept of the flipped classroom. The flipped classroom is a learning model that reverses the traditional teaching approach, where students first learn new material independently through videos, quizzes, or other self-directed learning resources prepared in advance. Meanwhile, face-to-face classroom sessions are used for active learning activities such as discussions, problem-solving, and collaboration (Baig & Yadegaridehkordi, 2023; Ma, 2023; Persky & McLaughlin, 2017). This approach supports pedagogical principles through two main components: (1) the use of computers for independent learning outside the classroom via instructional videos, and (2) interactive learning activities conducted within the classroom (Gutiérrez-González et al., 2023; Liu et al., 2024).

Based on the interview results, the lecturer expressed interest in implementing the learning model. The lecturer stated that "Time is not sufficient to deliver all materials within one meeting." The lecturer further explained that some materials could not be fully completed in a single session due to the extensive scope of the content. In addition, the lecturer mentioned, "Sometimes I have to continue the explanation in the next meeting because the discussion takes longer than expected." Regarding students' understanding, the lecturer noted, "Some students still have difficulty understanding the pharmacology concepts, especially when the explanation is too fast." The lecturer also added, "It is difficult to repeat the explanation because the time is limited." Concerning the flipped classroom model, the lecturer stated, "If students study the material first at home, the classroom session can be more focused on discussion and practice."

A questionnaire was distributed to students to collect data regarding their perspectives and learning needs in the herbal pharmacology course. The findings are presented in Table 1, which illustrates the analysis of students' learning needs enrolled in the Dharma Usada Study Program at Institut Nalanda.

Table 1. Analysis of Student Learning Needs

Item Code	Aspect	Response	Percentage
Q1	Do you find it easy to understand the concepts taught by the lecturer in the herbal pharmacology course?	a. Yes b. No	61% 39%
Q2	Do you often feel left behind during herbal pharmacology lectures?	a. Yes b. No	57% 43%
Q3	Does the lecturer rely too frequently on the lecture method in teaching herbal pharmacology?	a. Yes b. No	78% 22%
Q4	Does the lecturer use a variety of teaching methods in herbal pharmacology learning?	a. Yes b. No	61% 39%
Q5	Do you need a longer learning duration to ensure the herbal pharmacology material is delivered effectively?	a. Yes b. No	70% 30%
Q6	Do you need additional study time outside the scheduled class hours to better understand herbal pharmacology materials?	a. Yes b. No	61% 39%

https://doi.org/10.51276/edu.v7i2.1572

Item Code	Aspect	Response	Percentage
Q7	Are the herbal pharmacology learning media used by the lecturer complete and engaging?	a. Yes b. No	39% 61%
Q8	Are presentation slides the most frequently used learning media by the lecturer in herbal pharmacology classes?	a. Yes b. No	91% 9%
Q9	Are you comfortable using a computer, laptop, or smartphone as a learning tool?	a. Yes b. No	78% 22%
Q10	Do you have a reliable internet connection to access herbal pharmacology learning materials?	a. Yes b. No	87% 13%
Q11	Do you need more practice questions to assess your understanding of herbal pharmacology materials?	a. Yes b. No	96% 4%
Q12	Do example questions accompanied by explanations help improve your understanding of herbal pharmacology materials?	a. Yes b. No	87% 13%
Q13	Are you interested in using class time for more interactive and engaging learning activities?	a. Yes b. No	100% 0%
Q14	Are you interested in learning through a flipped classroom model, supported by interactive H5P modules that can be used both in and out of the classroom to enhance understanding of herbal pharmacology materials?	a. Yes b. No	96% 4%

The questionnaire results indicated that 61% of students found the lecturer's concepts easy to understand, while 39% still had difficulty comprehending the material. Meanwhile, 57% of students admitted that they often felt left behind during lectures, whereas 43% stated otherwise. Regarding teaching methods, 78% of students believed the lecturer relied too often on the lecture method, while 22% disagreed. Additionally, 61% of students acknowledged that the lecturer employed a variety of teaching methods, whereas 39% felt that such variation was still limited.

From the perspective of learning time, 70% of students stated they needed a longer instructional time to deliver the material effectively, while 30% stated otherwise. Furthermore, 61% indicated that they needed extra study time outside of class to fully understand the material, whereas 39% reported that additional time was unnecessary. Regarding learning media, 39% of students found the lecturer's media to be complete and engaging, while 61% did not. The majority of students (91%) reported that lecturers frequently relied on presentation slides as the primary learning medium, while 9% disagreed.

Regarding digital device support, 78% of students reported feeling comfortable using computers, laptops, or smartphones as learning tools, while 22% did not. Furthermore, 87% of students reported having adequate internet access to retrieve learning materials, whereas 13% reported insufficient connectivity. Additionally, 96% of students expressed the need for more practice exercises to assess their understanding of the material, while 4% disagreed. Moreover, 87% of students stated that example questions accompanied by detailed explanations could help improve their comprehension, whereas 13% did not share this view. All students (100%) expressed interest in participating in more interactive

https://doi.org/10.51276/edu.v7i2.1572

and engaging learning activities. Furthermore, 96% of students indicated that the flipped classroom learning model, supported by interactive H5P modules, was of interest to them, while 4% stated otherwise.

D. Discussion

The findings of this study clearly answer research Question 1 (RQ1): What are the main problems in current herbal pharmacology learning? The data indicate that learning remains predominantly lecture-based, with 78% of students perceiving that lecturers rely heavily on lectures and 91% reporting dominant use of static presentation slides (see Table 1). These figures demonstrate that the instructional model remains teacher-centred and minimally interactive. Such conditions contribute to reduced Engagement and conceptual depth, particularly in a discipline such as pharmacology, which requires analytical and applied competencies.

Moreover, 57% of students reported frequently feeling left behind in understanding the material, and 70% indicated that they require extended study time, with 61% needing additional time outside of class. These data reinforce the existence of a mismatch between instructional pacing and students' cognitive processing capacity. From the perspective of Cognitive Load Theory (Van Merriënboer & Sweller, 2010), dense information delivery within limited synchronous sessions may overload working memory, thereby reducing the effectiveness of knowledge construction.

This finding aligns with Persky & McLaughlin (2017), who argue that pharmacology education requires active Engagement to support higher-order thinking skills (HOTS). Similarly, Ma (2023) found that ineffective pacing in health education leads to conceptual gaps among students. However, unlike some studies in which lecture-based models remain effective in small cohorts, the present findings suggest that, in the context of the Dharma Usada Study Program, the current approach no longer adequately supports students' learning needs, as evidenced by the high percentage of students requesting additional time and practice opportunities. Thus, the empirical data confirm that current learning practices are insufficiently interactive, cognitively dense, and temporally constrained, necessitating pedagogical transformation.

Research Question 2 (RQ2) concerns students' readiness to adopt technology-enhanced learning. The findings demonstrate strong digital readiness: 78% of students reported being comfortable using digital devices, and 87% confirmed having adequate internet access (Table 1). These figures indicate sufficient infrastructure and digital literacy to support the implementation of blended and flipped learning.

This result aligns with Liu et al (2024), who reported that contemporary students prefer interactive, multimodal learning environments. Likewise, Gil-García et al (2023) found that H5P modules are effectively integrated within Moodle LMS environments and are well received in asynchronous settings. In contrast to contexts where technological limitations hinder flipped classroom implementation, the present study reveals that

https://doi.org/10.51276/edu.v7i2.1572

technological readiness is not a barrier but rather a supporting factor in the Dharma Usada program.

Additionally, motivational readiness is particularly strong: 100% of students expressed a desire for more interactive and enjoyable learning experiences, and 96% expressed interest in a flipped classroom supported by H5P modules. These percentages indicate intrinsic motivation for pedagogical change. From a Self-Regulated Learning (SRL) perspective, Zimmerman & Schunk (2001) argue that such motivation is crucial for successful independent pre-class preparation. Therefore, both infrastructural and motivational readiness strongly support the feasibility of integrating the flipped classroom.

Research Question 3 (RQ3) explores how the flipped classroom design can systematically address the instructional problems identified in this study. Based on the empirical findings, a structured three-phase model—pre-class, in-class, and post-class—is proposed as a pedagogically coherent framework.

In the pre-class phase, learning materials are delivered through interactive videos embedded with quizzes, immediate automated feedback, and short, segmented content to reduce cognitive load. This structure directly responds to the finding that 57% of students reported frequently feeling left behind, as it allows learners to regulate their own pace before attending face-to-face sessions. The integration of embedded quizzes addresses the 96% of students who requested more practice questions and the 87% who indicated that worked examples with explanations enhance their understanding.

Immediate feedback functions as formative assessment, strengthening retention and minimising misconceptions, consistent with Persky & McLaughlin (2017). This approach aligns with Baig & Yadegaridehkordi (2023), who found that flipped learning enhances conceptual readiness prior to class. However, unlike studies that simply relocate lectures to online platforms, the present design emphasises interactive segmentation and embedded assessment to more effectively manage cognitive load and promote active Engagement.

During the in-class phase, instructional time is reallocated to application-oriented activities such as case discussions on herb-drug interactions, structured problem-solving exercises, and guided clinical practice tasks. This pedagogical shift directly addresses the previously identified dominance of lecture time (78% perceived heavy reliance on lectures) and the need for deeper conceptual Engagement.

Given that pharmacology requires analytical reasoning, synthesis, and contextual application, face-to-face sessions are strategically used to cultivate higher-order thinking skills (HOTS). Constructivist principles (Efgivia et al., 2021) support this transition, as knowledge is actively constructed through dialogue, collaboration, and contextualised problem-solving. This finding aligns with Faro et al (2024), who emphasise that effective flipped classroom implementation depends on strong alignment between pre-class preparation and in-class higher-order learning activities.

The post-class phase focuses on reflection and reinforcement through structured reflective activities, remedial quizzes for students who are having difficulty, and additional enrichment tasks for advanced learners. This component responds directly to the finding

https://doi.org/10.51276/edu.v7i2.1572

that 70% of students require extended study time and 61% need additional learning outside class sessions.

By providing asynchronous reinforcement opportunities, the model supports the self-reflection stage of Self-Regulated Learning (SRL) theory (Shirk, 2020), in which students evaluate their understanding and adjust their learning strategies accordingly. Continuous formative assessment in this phase ensures consolidation of conceptual knowledge and sustained mastery of herbal pharmacology content.

Research Question 4 (RQ4) focuses on the specific interactive features required. The data show that only 39% of students consider current learning media engaging, while 61% do not. This gap highlights the need for multimedia innovation.

Based on students' responses and the principles of multimedia learning theory (Mayer, 2009), several interactive features in H5P are considered essential for effective learning in herbal pharmacology. These features include interactive videos that allow students to pause the content and answer embedded questions during the learning process, drag-and-drop activities that enable learners to identify active herbal compounds, and scenario-based quizzes that explore herb–drug interaction cases. In addition, the modules should provide immediate explanatory feedback for each response to help students understand their mistakes and reinforce conceptual understanding. The inclusion of adaptive navigation is also important, as it allows learners to revisit and review materials repeatedly at their own pace. Collectively, these interactive features respond directly to students' learning needs, particularly the 96% demand for more practice questions and the 87% preference for worked examples accompanied by detailed explanations.

This finding aligns with Gil-García et al (2023), who demonstrated the effectiveness of interactive H5P modules in asynchronous environments. It also supports Liu et al (2024), who highlight multimodal Engagement as a characteristic of digital-native learners. Compared to traditional static slides (reported by 91% of students), H5P provides multimodal integration—visual, auditory, and interactive—thereby reducing passive information reception and enhancing cognitive Engagement. Based on the integrated findings, this study proposes a concise conceptual transformation model:

Table 2. Conceptual Model: How Flipped Classroom and H5P Address the Identified Problems

Identified Problem	Pedagogical Solution	H5P Integration	Expected Impact
78% lecture dominance	Shift to a flipped structure	Interactive pre-class modules	Increased Engagement
57% feel left behind	Self-paced learning	Embedded quizzes and feedback	Reduced learning gaps
96% want more practice	Formative assessment	Interactive question banks	Improved retention
61% find media unengaging	Multimedia innovation	Interactive video & simulation	Higher motivation
70% need more time	Blended flexibility	Asynchronous access	Time efficiency

https://doi.org/10.51276/edu.v7i2.1572

This conceptual model demonstrates that integrating the flipped classroom, supported by interactive H5P modules, systematically addresses cognitive, temporal, motivational, and media-design problems identified in the needs analysis.

Overall, the findings indicate that integrating flipped classroom pedagogy with interactive H5P modules is not merely a technological innovation but a pedagogical restructuring grounded in empirical data from the Dharma Usada Study Program. The transformation redefines the lecturer's role from knowledge transmitter to learning facilitator, positioning students as active constructors of knowledge. By explicitly linking each empirical finding to a structured instructional solution, this study confirms that integrating the flipped classroom with H5P modules is a strategic, evidence-based response to the identified learning needs in herbal pharmacology education.

E. Implication

The findings of this study contribute to theory by reinforcing the relevance of Cognitive Load Theory, Self-Regulated Learning (SRL), and Multimedia Learning Theory in the context of herbal pharmacology education. The fact that 57% of students reported feeling left behind and 70% required extended study time empirically supports the assumption of excessive cognitive load caused by dense lecture-based instruction. Meanwhile, the strong student interest in flipped learning (96%) and interactive experiences (100%) strengthens the application of SRL theory, particularly in the forethought and self-reflection phases of independent learning. Additionally, dissatisfaction with current media (61%) supports Multimedia Learning Theory, which emphasises the importance of multimodal integration to enhance cognitive processing. Thus, this study extends these theoretical frameworks into the specific domain of traditional herbal pharmacology learning, which has been relatively underexplored in digital pedagogy research.

In practice, the study provides concrete recommendations for lecturers on designing flipped classroom instruction supported by H5P modules. The empirical findings—such as 96% of students requesting more practice questions and 87% valuing worked examples—indicate the need to embed interactive quizzes with immediate explanatory feedback in pre-class materials. Lecturers are encouraged to replace static slide presentations with interactive presentations, integrate interactive videos containing embedded formative assessments, develop drag-and-drop identification exercises for herbal components and active compounds, and construct quiz banks for continuous evaluation. Furthermore, instructional design should follow a structured sequence: pre-class (interactive video and embedded quiz), in-class (case discussion, problem-solving, and guided clinical practice), and post-class (reflection and remedial quizzes). Such alignment ensures that flipped learning is implemented systematically rather than merely shifting lectures online.

At the institutional level, successful implementation of flipped classroom integration requires structural and policy support. The institution should ensure a stable LMS infrastructure capable of integrating H5P modules, provide systematic training programs for lecturers in interactive content development, and establish monitoring and evaluation

https://doi.org/10.51276/edu.v7i2.1572

mechanisms to assess instructional effectiveness. Given that 87% of students reported adequate internet access, and 78% were comfortable with digital devices, the institutional environment is conducive to digital transformation. However, sustainability depends on strategic planning, including curriculum alignment, recognition of workload for digital content development, and continuous quality assurance. Therefore, institutional commitment is essential to transform this innovation into a long-term pedagogical model within herbal pharmacology education.

F. Limitation and Suggestion for Further Research

Several limitations should be acknowledged in interpreting the findings of this study. First, the sample size was relatively small, involving only 21 students from a single study program (Dharma Usada Study Program at Institut Nalanda). Therefore, the generalizability of the findings to other programs or institutions may be limited. Second, the data were predominantly based on students' perceptions collected through questionnaires, observations, and interviews. Although triangulation was applied, the results still largely reflect self-reported experiences rather than objective measurements of learning performance. This may introduce subjective bias into the evaluation of instructional effectiveness. Third, this study focused on needs analysis and has not yet empirically tested the effectiveness of the flipped classroom model assisted by interactive H5P modules through an experimental or quasi-experimental design. Consequently, the conclusions are limited to identifying learning needs and proposing a conceptual design rather than demonstrating measurable improvements in learning outcomes.

Future research should extend this study through a systematic research and Development (R&D) approach. The first stage should involve the structured design of interactive H5P modules aligned with learning outcomes, followed by expert validation (content, instructional design, and media experts) to ensure content accuracy and pedagogical quality. The second stage should include limited pilot testing to examine usability, clarity of instructions, and technical functionality of the H5P modules within the LMS environment. Feedback from this stage can be used to refine the instructional design. The third stage should involve a quasi-experimental study using a pretest–posttest control-group design to examine the effectiveness of the flipped classroom, assisted by H5P modules, compared to conventional instruction.

Future studies are recommended to measure the impact of the model on multiple variables, including: (1) student Engagement, (2) learning outcomes, (3) higher-order thinking skills (HOTS), and (4) learning satisfaction. Objective assessment instruments and performance-based evaluations should be incorporated to complement perception-based data. By addressing these limitations and implementing a structured follow-up research agenda, future investigations can provide stronger empirical evidence on the effectiveness and scalability of integrating interactive H5P modules into herbal pharmacology education.

https://doi.org/10.51276/edu.v7i2.1572

G. Conclusion

The findings of this study demonstrate that herbal pharmacology learning at Institut Nalanda remains predominantly lecture-based and teacher-centred, resulting in limited instructional variation, low student Engagement, and suboptimal alignment between complex subject content and learning effectiveness. The needs analysis clearly indicates that students require more flexible, autonomous, and interactive learning experiences that facilitate deeper conceptual understanding through contextual and technology-supported activities.

The results also reveal adequate digital readiness among students, reflected in their frequent use of online learning platforms and positive perceptions toward interactive multimedia tools. Based on these findings, the integration of a flipped classroom model supported by interactive H5P modules is strongly recommended to enhance active learning, improve Engagement, and optimise learning time both in and out of the classroom. Therefore, the next phase will focus on developing and validating a flipped classroom-based herbal pharmacology learning model supported by interactive H5P modules to ensure its effectiveness and pedagogical feasibility.

References

Al-Karadsheh, O., Abutayyem, H., Saidi, A., & Shqaidef, A. (2025). Knowledge Acquisition and Student Perceptions of Three Teaching Methods: A Randomized Trial of Live, Flipped, and Interactive Flipped Classrooms. *BMC Medical Education, 25*(1). https://doi.org/10.1186/s12909-025-07156-0

Baig, M. I., & Yadegaridehkordi, E. (2023). Flipped Classroom in Higher Education: A Systematic Literature Review and Research Challenges. *International Journal of Educational Technology in Higher Education, 20*(1). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1186/s41239-023-00430-5

Deng, Z., & Yang, Z. (2025). Exploring the Impact of Online Education on Student Engagement in Higher Education in Post-COVID-19: What Students Want to Get? *Frontiers in Psychology, 16*. Frontiers Media SA. https://doi.org/10.3389/fpsyg.2025.1574886

Dewi, H. H., Hidayatulloh, S. M. M., Sukarno, Lestari, A. E., Dewi, I. L., & Ciptaningrum, D. S. (2023). English Materials Development for an Undergraduate Communication Study Program: A Need Analysis in Indonesian Context. *LLT Journal: Journal on Language and Language Teaching, 26*(1), 69–91. https://doi.org/10.24071/llt.v26i1.5208

Divjak, B., Rienties, B., Iniesto, F., Vondra, P., & Žižak, M. (2022). Flipped Classrooms in Higher Education during the COVID-19 Pandemic: Findings and Future Research Recommendations. *International Journal of Educational Technology in Higher Education, 19*(1). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1186/s41239-021-00316-4

https://doi.org/10.51276/edu.v7i2.1572

Dsouza, M. J., Divyabharathy, R., & Daniel, A. J. (2025). Benefits and Limitations of Flipped Classroom. *Indian Journal of Community Medicine, 50*(2), 274–277. Wolters Kluwer Medknow Publications. https://doi.org/10.4103/ijcm.ijcm_535_23

Efgivia, M. G., Adora Rinanda, R. Y., Suriyani, Hidayat, A., Maulana, I., & Budiarjo, A. (2021). Analysis of Constructivism Learning Theory. *Proceedings of the 1st UMGESHIC International Seminar on Health, Social Science and Humanities (UMGESHIC-ISHSSH 2020)*. https://doi.org/10.2991/assehr.k.211020.032

Falasi, M. (2024). Innovative Pedagogies: A Comparative Analysis of Traditional and Modern Teaching Methods. *Academy of Educational Leadership Journal, 28*(S1), 1–2.

Faro, M. H., Gutu, T. S., & Hunde, A. B. (2024). Improving Student Engagement with a Flipped Classroom Instruction Model in Ethiopian Higher Education Institutions: The Case of Mattu University. *PLoS ONE, 19*(10 October). https://doi.org/10.1371/journal.pone.0307382

Gil-García, I. C., Fernández-Guillamón, A., García-Cascales, M. S., & Molina-García, Á. (2023). Virtual Campus Environments: A Comparison between Interactive H5P and Traditional Online Activities in Master Teaching. *Computer Applications in Engineering Education, (May),* 1648–1661. https://doi.org/10.1002/cae.22665

Gutiérrez-González, R., Zamarron, A., Royuela, A., & Rodriguez-Boto, G. (2023). Flipped Classroom Applied to Neurosurgery in Undergraduate Medical Education. *BMC Medical Education, 23*(1). https://doi.org/10.1186/s12909-023-04158-8

Haziki, N. H., Abdullah, A. H., & Hamzah, M. H. (2025). Flipped Classrooms in Higher Education: A Meta-Analysis of Their Impact on Mathematics Performance. *Malaysian Journal of Mathematical Sciences, 19*(1), 125–146. https://doi.org/10.47836/mjms.19.1.07

Jacob, T., & Centofanti, S. (2023). Effectiveness of H5P in Improving Student Learning Outcomes in an Online Tertiary Education Setting. *Journal of Computing in Higher Education*. https://doi.org/10.1007/s12528-023-09361-6

Judijanto, L., Zakiah, I., & Piatun Khodijah, U. (2024). Integrasi Teknologi Digital dalam Pembelajaran Kesehatan di Era Modern. *JK: Jurnal Kesehatan, 2*(8), 540–551.

Kakish, S., Makhamreh, Z., & Madanat, R. (2025). The Post-Pandemic Future of Digital Learning: The H5P and Interactive Learning. *Ubiquitous Learning, 18*(1), 201–217. https://doi.org/10.18848/1835-9795/CGP/v18i01/201-217

Liu, J., Cao, S., Liu, X., Ye, C., & Siano, P. (2024). Pre-Class Mode "Flipped" Again: Making Videos Instead of Just Watching Them. *Heliyon, 10*(6). https://doi.org/10.1016/j.heliyon.2024.e28105

Ma, Y. (2023). Exploration of Flipped Classroom Approach to Enhance Critical Thinking Skills. *Heliyon, 9*(11). https://doi.org/10.1016/j.heliyon.2023.e20895

Mayer, R. E. (2009). *Multimedia Learning* (2nd ed.). Cambridge University Press. https://doi.org/10.1017/CBO9780511811678

https://doi.org/10.51276/edu.v7i2.1572

Mazlan, R., Mahamod, Z., & Jamaludin, K. A. (2025). Flipped Classroom Approach of Language Education: A Systematic Review. *International Journal of Evaluation and Research in Education, 14*(2), 1235–1245. https://doi.org/10.11591/ijere.v14i2.31718

Molina-Torres, M. P. (2024). Flipped Classroom to Teach Digital Skills during COVID-19. *Journal of Technology and Science Education, 14*(1), 158–168. https://doi.org/10.3926/jotse.2256

Pablo-Lerchundi, I., Núñez-del-Río, C., Jiménez-Rivero, A., Sastre-Merino, S., Míguez-Souto, A., & Martín-Núñez, J. L. (2023). Factors Affecting Students' Perception of Flipped Learning over Time in a Teacher Training Program. *Heliyon, 9*(11). https://doi.org/10.1016/j.heliyon.2023.e21318

Panakaje, N., Ur Rahiman, H., Parvin, S. M. R., Shareena, P., Madhura, K., Yatheen, M., & Irfana, S. (2024). Revolutionizing Pedagogy: Navigating the Integration of Technology in Higher Education for Teacher Learning and Performance Enhancement. *Cogent Education, 11*(1). https://doi.org/10.1080/2331186X.2024.2308430

Persky, A. M., & McLaughlin, J. E. (2017). The Flipped Classroom – From Theory to Practice in Health Professional Education. *American Journal of Pharmaceutical Education, 81*(6). American Association of Colleges of Pharmacy. https://doi.org/10.5688/ajpe816118

Rahmi, U., Fajri, B. R., & Azrul, A. (2024). Effectiveness of Interactive Content with H5P for Moodle-Learning Management System in Blended Learning. *Journal of Learning for Development, 11*(1), 66–81. https://doi.org/10.56059/jl4d.v11i1.1135

Santilli, T., Ceccacci, S., Mengoni, M., & Giaconi, C. (2025). Virtual vs. Traditional Learning in Higher Education: A Systematic Review of Comparative Studies. *Computers and Education, 227*. https://doi.org/10.1016/j.compedu.2024.105214

Sareen, S., & Mandal, S. (2024). Challenges of Blended Learning in Higher Education across Global North-South: A Systematic and Integrative Literature Review. *Social Sciences and Humanities Open, 10*. Elsevier Ltd. https://doi.org/10.1016/j.ssaho.2024.101011

Sembiring, M. G. (2021). Pedagogical Challenges in Online Learning: 'Maxiagogy' as a Transformative Panacea Owing to the COVID-19 Outbreak. *International Conference on Open and Innovative Education (ICOIE 2021)*.

Sharmin, N., Houshyar, S., Stevenson, T. R., & Chow, A. K. (2025). Interactive Engagement with Self-Paced Learning Content in a Didactic Course. *Healthcare Informatics Research, 31*(1), 96–106. https://doi.org/10.4258/hir.2025.31.1.96

Sharmin, N., Pandya, J., Stevenson, T. R., & Chow, A. K. (2024). Interactive H5P Content for Increased Student Engagement in a Dental Hygiene Program. *Canadian Journal of Dental Hygiene, 58*(2).

Shi, X. Y., Yin, Q., Wang, Q. W., Lu, B. R., Li, G. X., Huang, S. H., & Sun, Z. G. (2024). Is the Flipped Classroom More Effective than the Traditional Classroom in Clinical

https://doi.org/10.51276/edu.v7i2.1572

Medical Education: A Systematic Review and Meta-Analysis. *Frontiers in Education, 9*. Frontiers Media SA. https://doi.org/10.3389/feduc.2024.1485540

Shirk, J. (2020). Designing a Self-Paced Learning Experience to Support Learner Self-Regulation. *Journal of Teaching and Learning with Technology, 9*(1). https://doi.org/10.14434/jotlt.v9i1.29527

Sinnayah, P., Salcedo, A., & Rekhari, S. (2021). Reimagining Physiology Education with Interactive Content Developed in H5P. *Advances in Physiology Education, 45*(1), 71–76. https://doi.org/10.1152/ADVAN.00021.2020

Tran, L. T. T., Cao, T. T., & Vo, V. L. H. (2023). Pedagogical Challenges in Online Teaching: A Qualitative Study on Vietnamese University Teachers of Social Sciences. *Vietnam Journal of Education, 227–239*. https://doi.org/10.52296/vje.2023.300

Van Merriënboer, J. J. G., & Sweller, J. (2010). Cognitive Load Theory in Health Professional Education: Design Principles and Strategies. *Medical Education, 44*(1), 85–93. https://doi.org/10.1111/j.1365-2923.2009.03498.x

Zimmerman, B. J., & Schunk, D. H. (2001). Self-Regulated Learning and Academic Achievement: Theoretical Perspectives. Routledge.

Zou, Y., Kuek, F., Feng, W., & Cheng, X. (2025). Digital Learning in the 21st Century: Trends, Challenges, and Innovations in Technology Integration. *Frontiers in Education, 10*. Frontiers Media SA. https://doi.org/10.3389/feduc.2025.1562391

Author's Biography

	**Kelik Widjonarko, S.Pd.** He was born in Jakarta, Indonesia, on February 2, 1981. He received his bachelor's degree in Economics Education from Universitas Negeri Jakarta (UNJ) and is currently pursuing a master's degree in Educational Technology at the same university. Email: kelikwidjonarko@gmail.com
	**Dr. Cecep Kustandi, M.Pd.** Serves as the Vice Dean II of the Faculty of Education (FIP) at Universitas Negeri Jakarta (UNJ). He obtained his doctoral degree in Educational Technology from Universitas Negeri Jakarta. Email: cecep-kustandi@unj.ac.id

https://doi.org/10.51276/edu.v7i2.1572

Prof. Dr. Maria Paristiowati, M.Si. Serves as the Coordinator of the Chemistry Education Study Program at Universitas Negeri Jakarta (UNJ). She was appointed as a Full Professor at Universitas Negeri Jakarta in the field of Chemistry Education Technology.
Email: maria.paristiowati@unj.ac.id