Jurnal Komunikasi Pendidikan
Vol. 10, No. 1 (2026), pp. 23-38 | p-ISSN: 2549-1725, e-ISSN: 2549-4163
http://journal.univetbantara.ac.id/index.php/komdik

Developing a Project-Based Hyper-Content E-Module to Support Students' Self-Regulated Learning in Higher Education

Agus Hadi Utama[1*], Qomario[2]
[1,2]Educational Technology, Universitas Lambung Mangkurat, Banjarmasin, Indonesia
E-mail: [1]agus.utama@ulm.ac.id*, [2]qomario@ulm.ac.id
*Corresponding Author

Article History:
Received: September 19, 2025; Revised: December 6, 2025; Accepted: December 12, 2025;
Published: January 31, 2026

ABSTRACT
This Research and Development (R&D) study aimed to develop a project-based learning (PjBL) hyper-content e-module to support students' Self-Regulated Learning (SRL) in higher education. Utilizing the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), the research addressed the need for innovative digital resources in the Learning Resource Center Management Course at Educational Technology Study Program Lambung Mangkurat University. Unlike previous studies that focused on isolated variables, this research integrates development, PjBL implementation, and SRL impact analysis. The hyper-content e-module incorporates multimodal features, including audio, video, infographics, and QR codes, to facilitate independent exploration. Validation by experts yielded high feasibility scores: 89% from material experts, 87% from media experts, and 88% from instructional design experts. Through qualitative content analysis conducted during the analysis and evaluation phase, the results confirmed that the PjBL-integrated e-module effectively improved students' learning independence by providing structured, project-oriented digital pathways. The results confirm that the e-module is a feasible and effective tool for modernizing instructional delivery. This study contributes an innovative framework for digital resource management and provides a foundation for future applied research in enhancing educational quality through self-regulated, technology-enhanced learning environments.

Keywords: *Innovative Learning Resources, Hyper Content E-Module, Project-Based Learning, Self-Regulated Learning, Learning Resource Center*

INTRODUCTION

The era of digital transformation has fundamentally changed the way learning occurs in higher education. In this age of the Internet of Things (IoT) and information explosion, students require self-regulated learning (SRL) abilities and 21st-century skills such as critical thinking, collaboration, creativity, and communication. These competencies are crucial for navigating the dynamic and unpredictable flood of information disruption (Saputra, H. N., & Salim, S., 2020). The level of student learning independence can be measured through the use of specially designed interactive learning resources, feedback on innovative learning resources, and self-motivation. Research by Zhang and Ma (2023) highlights the importance of digital technology-based interactive learning resources by conducting a meta-analysis on the effect of project-based learning. Although many similar studies exist, the superiority of their meta-

analysis lies in its extensive data scope and higher statistical precision, which unifies findings from various studies and provides stronger, more broadly applicable evidence. Meanwhile, Widyaningrum et al. (2023) introduced a digital innovation learning resource in the form of a hyper content e-book. This product is superior to ordinary e-books because it integrates various media, such as text, images, videos, and animations, and features a non-linear structure. This allows learners to dynamically explore information and gain a more profound, self-regulated learning experience. According to their findings, the hyper content e-book aims to increase student engagement and help them achieve better conceptual understanding. This innovation in hyper content digital learning resources can serve as a model for the development of similar digital learning resources today.

Various universities have developed digital innovations in the form of hyper content e-modules to improve the quality of their instruction. Both e-books and hyper content e-modules share features like audio-visual infographics, hyperlinks, and QR codes, which facilitate in-depth access to other digital learning resources. This, in turn, can enhance the effectiveness of self-regulated learning and the variety of specially designed innovative learning resources (learning resources by design). A hyper content e-module that integrates the project-based learning (PBL) approach can be an effective solution to assist students in learning independently. This innovation merges the advantages of digital technology with the principles of constructivist learning, where students actively construct their own knowledge. The development of the project-based hyper content e-module in this research is specifically for the Learning Resource Center Management Course. One of the course learning outcomes (CLOs) prioritizes a student-centered project-based learning approach with a more flexible learning experience (Safitri, W. D., Situmorang, M., Silaban, R., & Sudrajat, A., 2022).

Previous research has proven that the use of hyper content e-modules is effective for training argumentation skills. Concurrently, the project-based learning (PBL) approach is also proven to enhance students' critical thinking skills. Another study shows that compared to conventional methods, learning using a project-based hyper content e-module not only significantly increases students' learning outcomes and academic achievement but also sharpens their sensitivity in solving contextual problems and improves non-technical skills (soft skills), such as critical thinking (Zhang, L., & Ma, Y., 2023). Further research indicates that a web-based (HTML5) hyper content e-module with a project-based learning approach can serve as an interactive and flexible medium to support the effectiveness of collaborative self-regulated learning. It helps students understand difficult concepts, boosts their interest and practical skills, and motivates them to learn more deeply through problem-solving (Holisoh, A., Pahamzah, J., & Hidayat, S., 2025). However, despite these advancements, a significant research gap remains. Most previous studies have focused on these elements in isolation: focusing either on the technical feasibility of e-modules (Santosa, 2024), the general effectiveness of PjBL on critical thinking (Zhang & Ma, 2023), or the theoretical benefits of hyper-content (Widyaningrum et al., 2023). There is a distinct lack of empirical evidence regarding the integrated synergy between hyper-content architecture and project-based learning workflows specifically designed to catalyze self-regulated learning.

Theoretically and practically, the use of a hyper content e-module as an innovative learning resource has been proven to increase the effectiveness, attractiveness, and variety of learning. This is due to the inherent characteristics of the hyper content e-module, which integrates various features, such as hyperlinks and QR codes. These features allow direct access to other digital learning resources, such as cloud computing platforms and YouTube. Thus, this hyper content e-module can provide broader references and encourage students to learn independently and in-depth (Santosa, E. B., 2024). On the other hand, the implementation of project-based learning (PBL) significantly helps develop students' higher-

order thinking skills, creativity, and learning independence. When the hyper content e-module is implemented within the framework of project-based learning, students show an increased level of learning independence. Furthermore, this project-based learning approach also trains students to adapt to modern learning principles that are relevant to the demands of the 21st century (Nisa, H., Sufyadi, S., & Utama, A. H., 2023).

The Educational Technology Study Program Lambung Mangkurat University aims to produce graduates who are proficient in designing, developing, utilizing, managing, and evaluating innovative learning resources to catalyze and intervene in learning barriers. To keep pace with the fast-moving and unpredictable era of digital information disruption, the Department continually innovates in the fields of educational technology, instruction, and performance technology. One of the innovative learning resources to be developed in this research is a hyper content e-module for the Learning Resource Center Management Course in the Educational Technology Study Program Lambung Mangkurat University, which is relatively new and has limited learning resources (Pujiati, P., Fanni Rahmawati, F., Rahmawati, R., & Albet Maydiantoro, A., 2022). The learning outcomes of the Learning Resource Center Management Course are to teach students how to manage flexible and innovative learning resources, including physical, digital, and virtual libraries. This ensures they are prepared to plan, develop, and evaluate learning resource centers across various formal and non-formal educational institutions.

Referring to the theoretical foundation and empirical evidence presented above, this research aims to develop and test the effectiveness of a project-based learning hyper content e-module for the Learning Resource Center Management Course. The main focus is to answer two key questions: How to develop a feasible project-based learning (PjBL) hyper-content e-module to support the self-regulated learning (SRL) of students in the Educational Technology Study Program Lambung Mangkurat University? How effective is the project-based learning (PjBL) hyper-content e-module in enhancing students' learning independence or self-regulated learning (SRL)?

METHODS

Research Design

This study employs a Research and Development (R&D) approach, specifically utilizing the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The ADDIE framework was selected for its systematic, structured, and results-oriented nature, ensuring that the development of the project-based hyper-content e-module is grounded in rigorous evaluation at every stage (Ardiansah & Miftakhi, 2020). The development process is structured into five distinct phases:

Analysis: This initial phase involves a qualitative content analysis of existing curricula, student needs, and previous literature regarding the interrelation of project-based learning (PjBL) and self-regulated learning (SRL). This method allows for an in-depth understanding of the specific content requirements for the Learning Resource Center Management Course and identifies the gap in SRL resources (Sitasari, 2022). **Design:** Based on the analysis, a blueprint for the hyper-content e-module is created. This includes mapping out the non-linear navigation, PjBL project tasks, and the integration of multi-modal features (video, QR codes, and infographics).

Development: The actual production of the e-module. In this stage, the prototype is validated by material, media, and instructional design experts to ensure technical and pedagogical feasibility. **Implementation:** The e-module is deployed in the Educational Technology Study Program at Lambung Mangkurat University. Students interact with the project-based tasks within the digital environment. **Evaluation:** Both formative and summative

evaluations are conducted. Qualitative content analysis is used again here to interpret student feedback and project outcomes, specifically measuring the impact of the e-module on enhancing student learning independence (SRL). The systematic of development ADDIE model research designs are summarized in more detail figure 1, as follows:

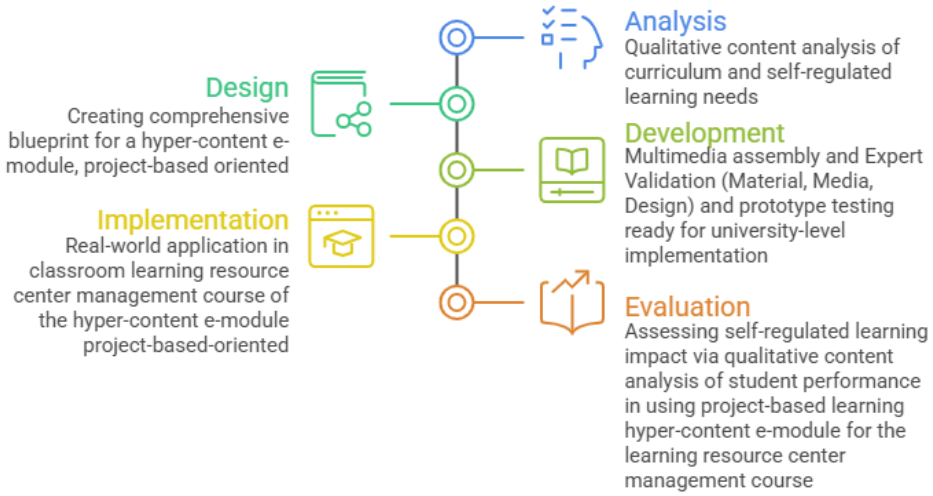

Figure 1. Research Design ADDIE Model for Project-Based Oriented Hyper-Content E-Modules in Support of Student Self-Regulated Learning

Participants

Participation in this research involved the students from the Learning Resource Center Management Course, 5th (fifth) Semester, in the Educational Technology Study Program Lambung Mangkurat University, with a sample size of 48 individuals. Participants in the study are individuals, groups, or subjects who are involved and serve as data sources. They are the individuals who are researched or observed to obtain the necessary information regarding the impact of project-based learning on students' learning independence. Participants were selected based on specific criteria relevant to the research objective: developing and testing the effectiveness of a project-based learning hyper content e-module for the Learning Resource Center Management Course. Therefore, all students enrolled in the Learning Resource Center Management Course were involved to ensure that the data collected is accurate and relevant to the research questions being investigated (Daulai, N., & Sari, S. M., 2024).

Data Collection

This research follows the ADDIE (Analysis, Design, Development, Implementation, Evaluation) framework as the primary R&D model. To ensure a comprehensive understanding of the e-module's impact on Self-Regulated Learning (SRL), data is collected through a combination of Qualitative Content Analysis, Questionnaires (Expert and Student), and Classroom Observation Sheets (Zein, M., & Utama, A. H., 2022). **Analysis Phase (Needs Assessment):** The data collection begins with a Qualitative Content Analysis of the existing curriculum and a literature review. This stage identifies research gaps and maps out the essential characteristics of the Learning Resource Center Management Course. Additionally, needs assessment questionnaires are distributed to students to identify barriers to independent learning.

Design and Development Phase (Validation): During these phases, the e-module is constructed using tools such as Lectora Inspire, Articulate Storyline, and Canva. Data is collected using Expert Validation Questionnaires (Expert Judgment). Material experts, media

experts, and instructional design experts to evaluate the prototype based on: Accuracy of content (Material), Interactivity and navigation (Multimodal), and PjBL-SRL integration logic (Instructional Design).

Implementation and Evaluation Phase (Impact Measurement): In the final stages, data is collected to measure the effectiveness of the PjBL-integrated hyper-content e-module by:

1. Classroom Observation Sheets: Used during the implementation to record student engagement and how they navigate the project-based tasks.
2. Qualitative Content Analysis: Applied to student project outcomes and feedback to interpret the depth of their self-regulated learning.
3. SRL Questionnaires: Administered to students to quantitatively measure the increase in learning independence after using the e-module. (Zimmerman, B. J., 1990)

Data Analysis

This research stems from the need for relevant learning resources and the limited availability of material for the Learning Resource Center Management Course, a new subject within the curriculum of the Educational Technology Study Program Lambung Mangkurat University. The main objective of this study is to develop a valid and effective hyper content e-module for the Learning Resource Center Management Course. This e-module is designed with a project-based learning (PBL) approach to encourage students to be actively and independently engaged in the learning process. Sutisnawati et al. (2022) state that the effectiveness of using a hyper content e-module is measured based on three indicators of student learning independence: (1) their activity in using the e-module, (2) their ability to provide feedback, and (3) their self-motivation to learn by utilizing the hyper content features to access various digital resources. These three indicators were adapted into the qualitative content analysis method. Aspects of these indicators were then incorporated into the research instruments, which include a literature review, classroom observation on the level of learning independence and reflection of student learning experiences, expert judgment feasibility questionnaires, and hyper content e-module user response questionnaires. By measuring these indicators, the research can determine how effective the developed e-module is in facilitating students' self-regulated learning (Khaerani, K., Usman, M., & Nurmayanti, N., 2023). To systematically address these research objectives and ensure a rigorous development process, the study aligns the measurement of learning independence indicators with the specific stages of the ADDIE model, as detailed in the following framework tabel 1.

Table 1. The Systematic ADDIE Framework for E-Module Development and Data Analysis Triangulation

ADDIE Phase	Data Collection Tool	Source of Data	Data Analysis
Analysis	Content Analysis & Learning Course Curricula	Study Literature & Students	Identifying SRL Needs & Course Gaps
Design	Storyboarding & Flowcharting	Researcher	Creating the PjBL-Hypercontent Blueprint
Develop	Expert Validation Questionnaire	Experts	Ensuring Feasibility (Media, Material, Design)
Implement	Classroom Observation Sheet	Learning Activities	Monitoring PjBL Workflow & Student Engagement
Evaluate	Content Analysis & SRL Questionnaire	Student Outcomes	Measuring the Final Impact on Learning Independence (SRL)

RESULTS AND DISCUSSION

Results

1. Analysis Phase

This phase involves gathering information/references and conducting a literature review related to the development of a project-based learning hyper content e-module, its connection to student self-regulated learning (SRL), and analyzing the characteristics of graduate learning outcomes (CLOs) and the specific CLOs of the Learning Resource Center Management Course as a reference for analyzing and assessing student learning needs. The literature review on the variables of learning independence and the project-based learning approach found that learning independence is the students' ability to learn autonomously, encompassing self-regulation in the learning process. The review indicated that various media and learning models can indeed enhance student learning independence. For instance, in Lestari's (2025) research, a science textbook with an ethnoscience-oriented Project-Based Learning model proved effective in increasing the learning independence of 5th-grade elementary students. The Project-Based Learning model is an instructional model that focuses on projects as the core of the learning process. Based on the summarized literature review findings, the Project-Based Learning model can be integrated with various learning media to improve student learning outcomes. PBL can be applied in e-modules, such as those developed for JavaScript and HTML5 web-based learning (Dahlia, D., Mubarrak, J., & Nasution, M., 2024). Febrianti's (2024) research on project-based learning hyper content e-modules demonstrated that the hyper content e-module medium can be applied in the learning process to help students learn independently and increase their motivation. A development study of a project-based learning basic programming e-module showed that the e-module could be adapted to a self-regulated learning model by meeting the characteristics of a good e-module: self-instruction, self-assessment, self-contained, stand-alone, adaptive, and user-friendly. This e-module also proved effective in facilitating student independent learning (Ananda, S. R. P., & Herwanto, H. W., 2025). As a result, the integration of the Project-Based Learning model with e-books, e-modules, or other digital teaching materials is theoretically effective in increasing student learning independence and critical thinking skills.

Evaluation in the Analysis phase is determining the characteristics of the graduate learning outcomes and the CLOs of the Learning Resource Center Management Course, determining the analysis of project-based learning needs, along with the collected literature review, which will serve as the foundation for designing the initial concept of the hyper content e-module product. This e-module will be designed using a project-based learning approach to support student self-regulated learning in the Learning Resource Center Management Course.

2. Design Phase

The design of the initial hyper content e-module concept begins by gathering various relevant information and references from the learning materials of the Learning Resource Center Management Course. This information and these references may include text, images, animations, audio-visuals, and videos. Next, the researcher develops the initial design concept by conducting a flowchart brainstorming to create the interactive multimedia display, as well as designing the hyper content script and storyboard. Evaluation in the Design phase refers to the validity design of the research and development instruments, namely: literature study/documentation and creating research instruments in the form of class observation sheets for the level of student learning independence, class observation sheets for the reflection of student self-regulated learning experiences, expert judgment feasibility

questionnaires, and user response questionnaires for the hyper content e-module that will be developed.

The design of the class observation sheet for the level of student learning independence consists of 19 statements categorized into specific aspect indicators. These indicators are systematically structured to evaluate core components of Self-Regulated Learning (SRL), including:

1. Initiative and Learning Responsibility: Measuring the extent to which students actively make decisions and take full accountability for their assigned projects.
2. Self-Management and Monitoring: Assessing the students' ability to schedule tasks, monitor their own progress, and adjust learning strategies when encountering obstacles.
3. Autonomous Resource Utilization: Evaluating student engagement in exploring the multi-modal features within the hyper-content e-module and their ability to seek external digital resources independently (Hiemstra, R., 1994).

This instrument is designed to assess student learning independence across several aspects. First, it measures initiative and learning responsibility, which is the extent to which students actively make decisions and take full responsibility for the project being worked on. Second, it assesses self-management and self-monitoring, which includes students' ability to schedule, monitor progress, and evaluate and adjust their learning strategies. The third aspect is the independent use of learning resources, where the instrument measures students' activity in exploring resources within the e-module and seeking external learning resources. Furthermore, the instrument will also measure the aspect of motivation and internal drive, such as enthusiasm, perseverance in facing difficulties, and conviction regarding the benefits of the project results for their self-development. Another important aspect is interaction and collaboration ability (non-dependency), which assesses students' ability to discuss with the lecturer or collaborate with peers without losing independence in their learning process. Finally, this instrument will measure the aspect of knowledge transfer and application, which is the students' ability to apply the knowledge and skills gained from the e-module into the real-world execution of the Learning Resource Center Management Course project (Nurhayati, E., 2018).

The design of the class observation sheet for the reflection of student self-regulated learning experience is composed of 5 aspects to measure students' independent learning experience, particularly in the context of project-based learning (Kolb, D. A., 2014). The first aspect is project understanding and planning to measure students' comprehension of the driving question or problem, and their involvement in initial planning such as determining goals, schedules, and task division. The second aspect is implementation process and collaboration to measure students' ability to collaborate with group members, manage differences of opinion, and independently search for information or learning resources outside of the material provided by the lecturer. The third aspect is skill development (soft skills & hard skills) to determine whether the learning enhances critical thinking ability, encourages creative solutions, builds confidence in presenting ideas, trains collaboration, and the ability to manage time and resources (Gibbs, G., 1988). The fourth aspect is the lecturer's role and student feedback to measure the effectiveness of the lecturer's role as a facilitator providing guidance and the effectiveness of feedback provided during the project work process. The fifth aspect is results and learning impact to determine students' pride in their individual role in the project assignment, their ability to connect theory with real-world application, and whether the learning experience is meaningful and memorable in the project-based learning Learning Resource Center Management class (Blumenfeld, P. C., et al., 1991).

The design of the user response questionnaire instrument is used to evaluate the practicality (ease of use, usefulness, and efficiency) of the hyper content e-module (Nieveen, N., 1999). This instrument is designed to gather user responses regarding students' learning experience in using the e-module for project-based learning. The user response questionnaire instrument has 4 aspects to measure the practicality of the project-based learning hyper content e-module (Tessmer, M., 2013). The first aspect is ease of use to measure how easily users can access and open the e-module, the clarity of instructions, ease of navigation, and ease of understanding the language used. The second aspect is the e-module display and attractiveness to assess the layout, colors, images, font size and type, and the functionality of the hyper content features. This aspect also evaluates the combination of text, images, and videos in making the learning material engaging. The third aspect is the usefulness of content and learning process to measure the relevance of the material, the benefit of hyper content features in understanding difficult concepts, and how effectively the e-module motivates student self-regulated learning. The fourth aspect is project-based learning support to assess how clearly the e-module provides project guidelines, the sufficiency of learning resources, and the assistance from instructions and worksheets in completing the Learning Resource Center Management Course project assignment (Rochmad, R., 2012).

The design of the expert judgment feasibility questionnaire instrument consists of questionnaires for material expert testing, interactive learning multimedia expert testing, and instructional design expert testing. The material expert validity test aims to evaluate the feasibility of the hyper content e-module from the perspective of the learning material. This evaluation covers 3 crucial aspects: usefulness of content and learning process, material support for project-based learning, and material support for student learning independence. The interactive learning multimedia expert validity test aims to evaluate the feasibility of the hyper content e-module from the perspective of the learning media. This evaluation covers 4 crucial aspects: visual design and readability, functionality and interactivity, support for project-based learning, and support for student self-regulated learning. The instructional design expert validity test aims to evaluate the feasibility of the hyper content e-module from the perspective of instructional design. This evaluation covers 2 crucial aspects: usefulness of content and self-regulated learning process, and design support for project-based learning in the Learning Resource Center Management Course.

3. Develop Phase

This phase involves processing the creation of the initial product design that will be developed into the project-based learning hyper content e-module. Various cloud computing software/applications are used, such as Lectora Inspire, Articulate Storyline, Prezi, Canva, CapCut, Google Onedrive, and URL QR Code Shortening S.id to develop the complete product into a project-based learning hyper content e-module. After the final product is successfully compiled and developed into the project-based learning hyper content e-module, three expert validation tests (expert judgment) are conducted. The material expert is the lecturer in charge of the Learning Resource Center Management Course. The hyper content interactive multimedia validation test is conducted by a learning media expert, who is an educational technology lecturer with the functional position of Assistant Expert. The instructional design validation test is performed by an educational technology lecturer with the functional position of Lector. To guarantee the credibility and validity of the expert judgment, the researcher collaborates with an external lecturer from the Association of Educational Technology Study Programs-Indonesia (APS-TPI) in conducting the final product development design validation test.

Evaluation in the Develop phase is obtaining the results of the expert judgment feasibility test from the 3 experts: material expert, learning media expert, and instructional design expert. The material expert validation result aims to evaluate the feasibility of the final product development design of the hyper content e-module from the perspective of the learning material. Based on the assessment given by one material expert validator (the lecturer in charge of the Learning Resource Center Management Course), the percentage score of the hyper content e-module material feasibility questionnaire is 89% valid for use. The learning media expert validation result aims to evaluate the feasibility of the final product development design of the hyper content e-module from the perspective of interactive multimedia functionality. Based on the assessment given by one learning media expert validator (an educational technology lecturer with the functional position of Assistant Expert), the percentage score of the learning media feasibility questionnaire is 87% valid for use.

The instructional design expert validation result aims to evaluate the feasibility of the final product development design of the hyper content e-module from the perspective of self-regulated learning instructional design in the e-module. Based on the assessment given by one instructional design expert validator (an educational technology lecturer with the functional position of Lector), the percentage score of the instructional design feasibility questionnaire is 88% valid for use.

4. Implement Phase

This phase involves carrying out a series of research activities by implementing the final product development of the project-based learning hyper content e-module in the Learning Resource Center Management Course of the Educational Technology Study Program Lambung Mangkurat University, through observation data collection methods, namely: observing the level of student learning independence and the reflection of student self-regulated learning experiences in using the project-based learning hyper content e-module, as well as the user response questionnaire data collection method for the developed hyper content e-module.

Evaluation in the Implement phase is obtaining descriptive quantitative measurement data from three research instruments, namely: the research instruments for class observation on the level of student learning independence and reflection of student learning experiences, and the user/student response questionnaire instrument while using the project-based learning hyper content e-module to support student self-regulated learning.

To measure the student learning independence level observation instrument, classroom observation in the Learning Resource Center Management Course was conducted. The results, when viewed from the indicator aspect of initiative and learning responsibility, showed that students displayed independent attitudes in setting their learning goals through their projects, in accordance with the hyper content e-module guidelines. In the indicator aspect of self-management and self-monitoring, students were able to evaluate their learning strategies and make adjustments if they encountered difficulties. In the indicator aspect of independent use of learning resources, students actively implemented and explored various resources in the hyper content e-module (text, audio-visuals, QR code simulations, and other external links). In the indicator aspect of motivation and internal drive, students exhibited high enthusiasm for starting and completing project assignments. When looking at the indicator aspect of interaction and collaboration ability, students were able to identify when they needed assistance and appropriately asked the lecturer or peers. The final indicator aspect is knowledge transfer and application, where students were able to apply the knowledge and skills obtained from the hyper content e-module into the real-world situation of the Learning Resource Center Management Course project execution.

To measure the student self-regulated learning experience reflection observation instrument, classroom observation in the Learning Resource Center Management Course was conducted. This observation of student self-regulated learning experience reflection aims to interpret the impact of using the project-based learning hyper content e-module on student learning independence in higher education. The results of the student self-regulated learning experience reflection observation showed data on the indicator aspect of project understanding and planning, where students understood that the final goals and evaluation criteria for this project were well-explained from the start. Students were also able to easily access and open this hyper content e-module on their digital devices. Furthermore, in the indicator aspect of implementation process and collaboration, students were able to independently search for information and learning resources outside of the material provided by the lecturer and were able to collaborate with other group members to achieve project goals. In the indicator aspect of development of soft skills and hard skills and self-motivation, students were confident in conveying ideas and thoughts, and were encouraged to be active in finding creative and innovative learning solutions. In the indicator aspect of lecturer's role and feedback, students were confident in providing suggestions and input for improving the quality of project-based learning, related to cooperation in project assignments and assisting/providing constructive feedback to other project groups. Finally, in the indicator aspect of results and learning impact, students felt proud of their individual role in the project assignment and were satisfied with the product/final result produced in the project assignment, making this project-based learning experience more meaningful and memorable for students in the Learning Resource Center Management class, Educational Technology Study Program Lambung Mangkurat University.

To measure the hyper content e-module user response questionnaire instrument towards the final product design, the user response questionnaire was distributed to students in the Learning Resource Center Management class, aiming to describe the indicators of student learning independence in interacting with the hyper content e-module multimedia. The description from the user response questionnaire yielded data that in the indicator aspect of ease of use, students could easily access and open the hyper content e-module on their devices because it is web-based HTML5, compatible to be opened on any type of gadget or computer. In the indicator aspect of display and user attractiveness, students enjoyed the hyper content features presented, which functioned well. In the indicator aspect of usefulness of content and learning process, students were able to use the hyper content features to help them understand difficult concepts, making the self-regulated learning process more effective. The last indicator is the aspect of project-based learning support, where students were able to understand the instructions and worksheets in the hyper content e-module for planning, implementing, and compiling the project report. As a result, the final product development design of the hyper content e-module made it easier for students to produce the final product/work from the assigned project.

5. Evaluate Phase

The Evaluation phase involves conducting evaluations at every stage of the ADDIE development procedure, not just at the end of the process. Evaluation in the Analysis stage focuses on the characteristics of the graduate learning outcomes and the CLOs of the Learning Resource Center Management Course as a reference for analyzing and assessing student learning needs. This evaluation involves verifying the existence of the identified problems and ensuring that the proposed solution is relevant to the student learning needs analysis. Additionally, evaluation in the analysis stage also includes an in-depth review of the research subject and object through theoretical and empirical studies.

Evaluation in the Design stage focuses on the validity of the research instrument development and the initial product design concept for the innovative learning resource in the form of a project-based learning hyper content e-module for the Learning Resource Center Management Course. The process includes reviewing the objectives, strategy, and brainstorming the compilation of relevant and valid learning materials to ensure alignment with the learning needs analysis identified in the analysis stage. The review of the interactive multimedia flowchart design and the hyper content script and storyboard design is conducted to identify potential problems and necessary improvements before moving to the development stage.

Evaluation in the Develop stage focuses on the development of the final product design and the functionality of the project-based learning hyper content e-module, by conducting testing by a material expert to ensure the resulting learning material is valid and relevant, testing by an instructional design expert to ensure the accuracy and consistency of the learning design, and testing by a learning media expert to ensure the interactive multimedia functionality works as intended and guarantees that all hyper content features function properly.

Evaluation in the Implement stage focuses on the effectiveness of implementing student self-regulated learning with the project-based learning approach, which involves classroom observation data collection activities and user response questionnaires, in the form of observing the level of student learning independence and the reflection of student self-regulated learning experiences in using the project-based learning hyper content e-module, and distributing the user response questionnaire to students for the developed hyper content e-module. Evaluation in the implement stage includes verifying the collection of classroom observation data and user response questionnaires, strengthened by an unstructured interview method with the lecturer in charge of the Learning Resource Center Management Course to draw a conclusion regarding the impact of the project-based learning hyper content e-module on student self-regulated learning in the Educational Technology Study Program Lambung Mangkurat University. Based on the data validity test of the qualitative content analysis method through data source triangulation, the result obtained is that the development of the project-based learning hyper content e-module for the Learning Resource Center Management Course is feasible for use and has an impact on increasing student learning independence. Overall, the results of this research and development are depicted in the ADDIE model, as shown in Table 2 below.

Table 2. Evaluation Results and Feasibility Analysis of the PjBL-Integrated Hyper-Content E-Module within the ADDIE Framework

Evaluation Instruments	Validator / Respondent	Skor Percentage	Feasible Criteria
Accuracy of Content (Material Expert)	Course Lecturer of Learning Resource Center Management	89%	Valid/Feasible
Interactivity and Navigation (Media/Multimodal Expert)	Lecturer of Educational Technology	87%	Valid/Feasible
PjBL-SRL Integration Logic (Instructional Design Expert)	Lecturer of Educational Technology	88%	Valid/Feasible
Classroom Observation Sheets and SRL Questionnaires	Classroom Students' (User) of Learning Resource Center Management	Positive	Practical & Adaptive (HTML5)

Discussion

The development of the project-based learning hyper content e-module for the Learning Resource Center Management Course, using the ADDIE development model (starting from the analysis, design, develop, implement, and evaluate stages), has been declared feasible by the material expert, media expert, and instructional design expert, with percentages of 89%, 87%, and 88%, respectively. The research and development results for the project-based learning hyper content e-module were obtained from the qualitative content analysis method. After data collection, verification, and conclusion drawing through data validity testing and source triangulation techniques, the findings indicate that this hyper content e-module is proven to be effective and impactful in enhancing the learning independence (self-regulated learning) of students in the Learning Resource Center Management Course, Educational Technology Study Program Lambung Mangkurat University. The findings show students can learn flexibly, develop 21st-century skills, and adapt to the real world. Expert validation scores, averaging 88%, demonstrate that this product excels not only in content but also in instructional design. The use of the HTML5 format ensures high accessibility (as found in research by Dahlia et al., 2024), which indirectly supports the "stand-alone" and "user-friendly" aspects of a high-quality e-module.

The results of this study indicate that the integration of Project-Based Learning (PjBL) into the Hyper-Content E-Module creates a digital ecosystem that significantly enhances students' Self-Regulated Learning (SRL). The finding that hyper-content features (QR codes and multimedia) increase motivation aligns with research by Febrianti (2024), which states that hyper-content media assists students in learning autonomously. The non-linear structure of this e-module compels students to make their own navigational decisions, which is the core of learning initiative (Hiemstra, 1994). With features such as infographics, hyperlinks, and QR codes in HTML5 format, the hyper content e-module has made it easier for students in the Educational Technology Study Program Lambung Mangkurat University, to access other digital learning resources, ultimately increasing the effectiveness of self-regulated learning (Holisoh, A., Pahamzah, J., & Hidayat, S., 2025).

Observations showed that students were able to perform effective self-monitoring during project execution. This reinforces the findings of Lestari (2025) and Ananda & Herwanto (2025), suggesting that the PjBL model integrated into digital tools provides a clear framework for students to manage their own learning speed (self-paced learning). In contrast to previous studies which tended to focus on only one aspect—such as e-module development, the implementation of the Project-Based Learning model, or the effectiveness of self-regulated learning—this research possesses a key novelty by structurally combining these three aspects: the development of a hyper content e-module with a Project-Based Learning approach to enhance the effectiveness of student learning independence in the Educational Technology Study Program Lambung Mangkurat University, particularly in the Learning Resource Center Management Course. Thus, the results of this hyper content e-module research and development have implications for identifying and summarizing existing and relevant knowledge, especially for self-regulated learning in higher education with a project-based learning approach. Unlike previous studies that often-separated media development from pedagogical impact, this study successfully proves holistically—through the triangulation of observation data, questionnaires, and content analysis—that interactive multimedia design (Hyper-content), when combined with appropriate instructional syntax (PjBL), yields independent learning behavior outcomes (SRL).

The interpretation of the results from the Project-Based Learning (PBL) approach also proves its effectiveness in boosting student learning independence and competency achievement, especially for the Learning Resource Center Management Course. According to Zimmerman B.J. (1990), the Project-Based Learning method creates relevant learning

experiences, encourages collaboration, and aids in deep material comprehension. Previous research also shows that PBL not only improves academic understanding but also hones 21st-century skills such as collaboration, communication, and problem-solving. Sutisnawati et al. (2022) add that the PBL approach plays a role in character formation and fostering students' self-regulated learning spirit. The research by Safitri et al. (2022) represents a breakthrough in implementing project-based digital learning resources to develop students' psychomotor skills, specifically in anion analysis learning. This study offers a new model that actively trains students' practical abilities, not just theoretical understanding. Meanwhile, the research by Holisoh et al. (2025) provides an update and deep synthesis regarding the use of e-modules in the context of self-regulated learning in higher education. This prospective literature review focuses on current trends and identifies future research directions related to the use of hyper content e-modules.

The findings of this study holistically demonstrate, through the triangulation of data (observations, questionnaires, and content analysis), that the integration of interactive multimedia design with PjBL syntax yields tangible Self-Regulated Learning (SRL) outcomes. This achievement surpasses previous research, which generally focused on only a single aspect of development. Overall, the continuous development of this project-based learning hyper content e-module is deemed important to facilitate student self-regulated learning, making it relevant to the higher education curriculum. However, the results of this study are still insufficient to prove the impact of project-based learning on student learning independence at the primary and secondary education levels. Therefore, further research is needed regarding the utilization and/or development of innovative learning resources to support student learning independence. The qualitative data supporting these findings by analysis content method, gathered through direct observation and student reflection, is synthesized in the following table 3:

Table 3. Analysis Content of Student Self-Regulated Learning (SRL) Levels and Experiential Reflections

Indicator Aspects	Self-Regulated Learning (SRL) Observation Results	Analysis Content Reflections on Learning Experience
Initiative & Planning	Students are able to set learning goals independently according to the e-module guidelines.	Deep understanding of the driving question and active engagement in task distribution.
Self-Management	Capable of evaluating learning strategies and making adjustments when encountering obstacles.	Improvement in soft skills (time management) and increased confidence in presenting ideas.
Resource Utilization	Active exploration of hyper-content features (QR Codes, Videos, and external links).	Ability to independently seek information resources beyond the materials provided by the instructor.
Motivation & Interaction	High enthusiasm in project completion; effective collaboration without losing individual autonomy.	A sense of pride in individual roles within the group and satisfaction with the final product.
Knowledge Transfer	Implementation of e-module theories into real-world projects for Learning Resource Center Management.	The learning experience becomes more meaningful by connecting to real-world applications.

CONCLUSION

The Research and Development (R&D) of the project-based learning (PjBL) hyper-content e-module for the Learning Resource Center Management Course has been successfully completed following the systematic ADDIE model. The study concludes that the developed

product is highly feasible, as evidenced by validation scores from material experts (89%), media experts (87%), and instructional design experts (88%). These results categorize the e-module as a valid and professional-grade digital learning resource. Implementation results demonstrate that the PjBL-integrated hyper-content approach significantly enhances student Self-Regulated Learning (SRL). Data-driven observations indicate that the indicators improving the most were Resource Utilization characterized by active exploration of non-linear digital pathways and Initiative & Planning, were students independently established project goals and task distributions. Furthermore, qualitative reflections confirmed that the e-module effectively bridged the gap between theoretical management concepts and real-world application.

The practical implications of this research suggest that hyper-content e-modules serve as a critical catalyst for student-centered learning in higher education, providing a scalable model for other specialized courses within the Educational Technology Study Program. However, as this study was limited to the university level, these findings may not be directly generalizable to primary or secondary education. Consequently, future research should investigate the longitudinal impact of hyper-content integration across diverse educational levels to further support the global shift toward autonomous digital learning.

ACKNOWLEDGEMENTS

This article is a mandatory output publication derived from the results of the Beginner Lecturer Research Program (PDP) BIMA 2025. This research is Supported by the Directorate of Research and Community Service, Directorate General of Research and Development, Ministry of Higher Education, Science, and Technology of the Republic of Indonesia (Kemdiktisaintek). Special thanks are extended to the Institute for Research and Community Service (LPPM) at Lambung Mangkurat University (ULM) for monitoring and evaluating the progress and final research reports, and for channeling the research funds for the PDP BIMA 2025 under Decree No. 075/C3/DT.05.00/PL/2025 dated May 28, 2025, and Contract No. 1447/UN8.2/PG/2025 dated June 02, 2025.

REFERENCES

Ananda, S. R. P., & Herwanto, H. W. (2025). Integrasi e-modul pembelajaran pemrograman dasar berbasis project-based learning dengan CAI untuk meningkatkan kemandirian belajar siswa SMK. *Journal of Innovation and Teacher Professionalism*, *3*(2), 391–402.

Ardiansah, F., & Miftakhi, D. R. (2020). Pengembangan buku ajar dengan model ADDIE pada mata kuliah manajemen teknologi pendidikan. *Journal of Education and Instruction (JOEAI)*, *3*(2), 247–258.

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, *26*(3-4), 369–398.

Dahlia, D., Mubarrak, J., & Nasution, M. (2024). Pengembangan e-modul berbasis Flip HTML 5 pada mata kuliah bioteknologi di program studi biologi Universitas Pasir Pengaraian. *Journal of Biology, Chemistry, Mathematics and Physics Education*, *1*(1), 16–26.

Daulai, N., & Sari, S. M. (2024). Developing natural and social science books integrating science process skills to enhance student learning outcomes in fifth grade elementary school. *Jurnal Komunikasi Pendidikan*, *8*(1), 99–107.

Febrianti, R. (2024, December). Optimizing Javascript learning through hypercontent e-module based on project-based learning. In *Proceedings of International Conference on Science and Technology for the Internet of Things* (Vol. 1, No. 01, pp. 1610–1625).

Gibbs, G. (1988). *Learning by doing: A guide to teaching and learning methods*. Further Education Unit.

Hiemstra, R. (1994). *Self-directed learning*. The University of Tennessee Knoxville.

Holisoh, A., Pahamzah, J., & Hidayat, S. (2025). Literature review on the use of electronic modules in independent learning in higher education. *Journal of General Education and Humanities*, *4*(1), 153–164.

Khaerani, K., Usman, M., & Nurmayanti, N. (2023). Development of science e-modules on solar system materials based on android for junior high school students. *Indonesian Journal of Instructional Media and Model*, *5*(1), 58–68.

Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development*. FT Press.

Lestari, N. A. P. (2025). *Pengembangan buku ajar IPA model project-based learning berorientasi etnosains untuk meningkatkan kemandirian belajar dan kemampuan berpikir kritis siswa kelas V SD* [Doctoral dissertation, Universitas Pendidikan Ganesha].

Nieveen, N. (1999). Prototyping to reach product quality. In *Design approaches and tools in education and training* (pp. 125–135). Springer.

Nisa, H., Sufyadi, S., & Utama, A. H. (2023). Pengembangan e-book berbasis web dengan pendekatan problem-based learning untuk meningkatkan motivasi siswa kelas VII di Madrasah Tsanawiyah. *J-INSTECH*, *4*(1), 12–22.

Nurhayati, E. (2018). *Psikologi pendidikan inovatif* (Vol. 2). Pustaka Pelajar.

Pujiati, P., Fanni Rahmawati, F., Rahmawati, R., & Albet Maydiantoro, A. (2022). Effectiveness of using hypercontent based e-module to improve college students' critical thinking skills. *WSEAS Transactions on Advances in Engineering Education*, *19*, 80–86.

Rochmad, R. (2012). Desain model pengembangan perangkat pembelajaran matematika. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *3*(1), 59–72.

Safitri, W. D., Situmorang, M., Silaban, R., & Sudrajat, A. (2022). Penerapan sumber belajar inovatif berbasis proyek untuk membangun psikomotorik mahasiswa pada pembelajaran analisis anion. *Jurnal Penelitian Sains dan Pendidikan (JPSP)*, *2*(2), 181–191.

Santosa, E. B. (2024). Problem based learning-oriented e-module to innovate learning activities in high school. *Journal of Education Research and Evaluation*, *8*(4), 622–632.

Saputra, H. N., & Salim, S. (2020). Potret sikap mahasiswa dalam penggunaan literasi digital. *Jurnal Komunikasi Pendidikan*, *4*(2), 94–101.

Sitasari, N. W. (2022). Mengenal analisis konten dan analisis tematik dalam penelitian kualitatif. *Forum Ilmiah*, *19*(1), 77–84.

Sutisnawati, A., Rosfiani, O., Hermawan, C. R., Fahrezi, M. I., Azie, I., Wahyuni, S., ... & Kamila, A. (2022). Penerapan model pembelajaran konstruktivis berbasis proyek untuk meningkatkan keterampilan literasi siswa kelas V sekolah dasar. *Jurnal Cakrawala Pendas*, *8*(4), 1604–1615.

Tessmer, M. (2013). *Planning and conducting formative evaluations*. Routledge.

Widyaningrum, R., Nursetyo, K. I., & Ardiansyah, A. A. (2023). Pengembangan buku hyper content untuk mata kuliah evaluasi program di prodi teknologi pendidikan FIP UNJ. *Jurnal Pembelajaran Inovatif*, *6*(2), 32–38.

Zein, M., & Utama, A. H. (2022). E-modul berbasis kvisoft flipbook maker sebagai sumber belajar materi analisis unsur pembangun puisi. *J-INSTECH*, *3*(1), 47–55.

Zhang, L., & Ma, Y. (2023). A study of the impact of project-based learning on student learning effects: A meta-analysis study. *Frontiers in Psychology*, *14*, Article 1202728.

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, *25*(1), 3–17.