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Artificial Intelligence Enhanced Learning Management System: Supporting Merdeka Belajar-Kampus Merdeka (MBKM) at a State University in Indonesia

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ABSTRACT

This research aims to develop an e-learning system integrated with ChatGPT in enhancing students' learning outcomes within the Merdeka Belajar Kampus Merdeka (MBKM). By adopting the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) approach, this study indicates a remarkable 80% satisfaction rate among users of the e-learning platform. Despite focusing on the e-learning development stage and content preparation, there remains an avenue for further investigation, specifically in the realm of classroom action research. The implementation of this e-learning portal stands as a significant milestone in educational technology, emphasizing accessibility, adaptability, and cost-efficiency, offering a durable platform for educational content. User feedback underlines the success of this development, endorsing its continued usage and potential for further advancements. This research not only addresses the immediate effectiveness of integrating ChatGPT into e-learning but also showcases the potential for continual enhancement and the ongoing evolution of educational technologies within the MBKM initiative at Universitas Sembilanbelas November Kolaka.

Keywords *E-Learning, Moodle, MBKM*

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INTRODUCTION

The utilization of Information and Communication Technology (ICT) in education has become a global trend in the current digital era. Various research and the development of e-learning systems are continuously undertaken to provide a more interactive and personalized learning experience for students. Several studies related to the application of ChatGPT in education have also been conducted. One study aimed to develop an integrated e-learning system with ChatGPT to enhance student learning outcomes (Firat, 2023). The study developed a ChatGPT model trained using datasets from an online learning platform. The research findings indicate that integrating ChatGPT into the e-learning system can improve student learning outcomes. Another study by

Kothari and Verma (2022) employed ChatGPT to facilitate discussions between teachers and students. In this research, ChatGPT was used to analyze and depict the sentiment of messages written by teachers and students. The results of the study demonstrate that ChatGPT can facilitate more effective discussions and strengthen the relationship between teachers and students.

Tapalova and Zhiyenbayeva (2022) conducted a case study examining the implementation of artificial intelligence technology in education. Survey results from 184 students across three universities in Kazakhstan indicated that the most perceived benefits by students when learning with AI technology assistance are personalized learning, enabling students to learn anytime and anywhere in real time, receiving regular feedback, and tailored learning content based on their needs. Beyond personalized learning, AI-based technology can also support the execution of assessment and evaluation within e-learning systems (Amali, Kadir & Latief, 2019). Their research revealed that AI-based technology can automatically assess students' assignments, thereby enabling teachers to save time and effort while focusing on providing feedback tailored to students' needs. Additionally, AI plays a significant role in gaming simulations within e-learning. AI-supported virtual simulation games can offer an interactive and engaging learning experience, aiding students in developing problem-solving skills, decision-making abilities, and creativity (Firat, 2023).

The usage of artificial intelligence (AI) in electronic learning (e-learning) has attracted significant interest in recent years due to its potential to enhance the effectiveness and accessibility of education. Especially with the release of the Chat GPT application to the public by OpenAI in December 2022, which reached 1 million users within 5 days, many individuals have had the opportunity to directly experience the level of achievement of this AI (Firat, 2023). In the literature, numerous researchers have investigated the integration of AI for various purposes in e-learning, including personalized learning, assessment and evaluation, educational gaming, and simulation (Kothari and Verma, 2022).

Personalized learning, also known as adaptive or individual learning, refers to the use of technology to tailor educational content and experiences according to the unique needs, interests, and abilities of each student (Fariani, Junus, & Santoso, 2022). It has been found that this approach can enhance student motivation and engagement, as well as improve learning outcomes (Manciaracina, 2022). AI-supported personalized learning systems can analyze data on student performance, preferences, and other factors to create customized learning paths and provide targeted support and feedback (Tapalova & Zhiyenbayeva, 2022).

AI can also be utilized for assessment and evaluation in e-learning. AI-powered assessment tools, such as multiple-choice test graders and composition assessment software, can automatically grade student submissions, enabling teachers to save time and effort while focusing on providing personalized feedback and support (Bearman, Nieminen, & Ajjawi, 2022). AI-supported assessment can also offer more objective and consistent evaluations, reducing the potential for bias and errors. Educational games and simulations are another area where AI can play a crucial role in e-learning. AI-supported games and simulations can provide engaging and interactive learning experiences that help students develop critical skills such as problem-solving, decision-making, and creativity (Bennani, Maalel, & Ben Ghezala, 2022). For instance, AI-supported virtual simulations can allow students to experiment with complex scenarios and test their knowledge and skills in a safe and controlled environment.

While prior research has addressed the utilization of ChatGPT in online learning, this study introduces several novel aspects, particularly the integration of ChatGPT into the e-learning system to support Merdeka Belajar Kampus Merdeka (MBKM) at Universitas Sembilanbelas November Kolaka. Moreover, there is a lack of specific research focusing on the integration of AI technology within e-learning systems and explicating the developmental stages of such integration. Previous studies primarily concentrated on literature reviews to address the research problem. Consequently, this research introduces innovation in the methodological aspect, employing a research and development approach to comprehensively delineate the stages involved in integrating AI technology into the e-learning system. Furthermore, this study aims to evaluate the effectiveness of utilizing the e-learning system integrated with ChatGPT in enhancing students' learning outcomes. This assessment will involve comparing students' learning outcomes before and after using the e-learning system integrated with ChatGPT. Ultimately, this research is expected to contribute to the MBKM by providing a more flexible and interactive learning alternative that supports personalized learning.

RESEARCH METHODE

The type of research conducted is research and development, employing the ADDIE model as the chosen development model. ADDIE is a systematic learning design model that was selected due to its systematic and theory-based approach to e-learning design (Urh et al., 2015). This structured and sequential model is well- suited to address the specific needs and characteristics of both teachers and students in the e-Learning development process. The ADDIE model

consists of five steps, which are as follows: (1) analyze, (2) design, (3) development, (4) implementation, and (5) evaluation. Each step in the model serves a crucial purpose in systematically addressing and resolving e-Learning development-related challenges (Sa'adah, 2021).

In this study, data was collected using observation and survey techniques. The survey employed questionnaires to evaluate and gather user feedback from lecturers at USN Kolaka. The sampling method utilized was simple random sampling, ensuring that each member of the population had an equal chance of being selected as a sample (Sa'adah, 2021). The questionnaire employed a 4-point response format from a Likert scale, offering the following alternative responses: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The Likert scale score was determined in advance. The Likert scale is a widely used method for measuring responses and opinions in surveys. It allows participants to express their level of agreement or disagreement with specific statements, enabling researchers to gain valuable insights into participants' perspectives and perceptions. By using simple random sampling and the Likert scale, the study ensures a fair representation of lecturers' opinions at USN Kolaka and facilitates a systematic approach to data collection and analysis. This methodology enhances the reliability and validity of the findings, enabling researchers to draw meaningful conclusions and make informed recommendations based on the feedback obtained from the survey. The indicators utilized for evaluating the e-learning to be developed are presented in Table 1.

Table 1.
Questionnaire Indicators

Indicators	Number of Question
User satisfaction	2
Usability	2
Graphic design	3
Navigation	2
Content	3
Individual impact	3

Data analysis was conducted to determine the evaluation results. In this study, statistical aspects were not extensively examined, so the data was analyzed using a descriptive percentage system. Descriptive data was presented in percentage form, following the formula:

$$P = \underline{n} \times 100 \,\&\, N$$

Description:
P = Percentage sub variable
n = Value of each sub variable
N = Max score

After obtaining the percentage for each sub-variable indicator, the next step involved analyzing the data by referring to the range percentage chart and the system criteria to determine the corresponding criteria.

Table 2.
A Percentage Range and Qualitative Criteria System

No	Interval	Criteria
1	76% < score ≤ 100%	Good
2	51% < score ≤ 75%	Enough
3	26% < score ≤ 50%	Not good
4	0% < score ≤ 25%	Bad

RESULT AND DISCUSSION

The e-Learning portal has been created based on an analysis of the current condition of human resources, infrastructure, and school conditions. The development of the e-Learning portal utilized MOODLE version 3.8.+4, which supports SCORM format. Before being installed on the hosting server, a prototype installation was conducted to ensure that the portal would function correctly. The prototype installation took place on a local server using the XAMPP 1.6.7 package with PHP 5.2.6, Apache 2.2.9, MySQL 5.0.51, and Win XP SP2 OS.

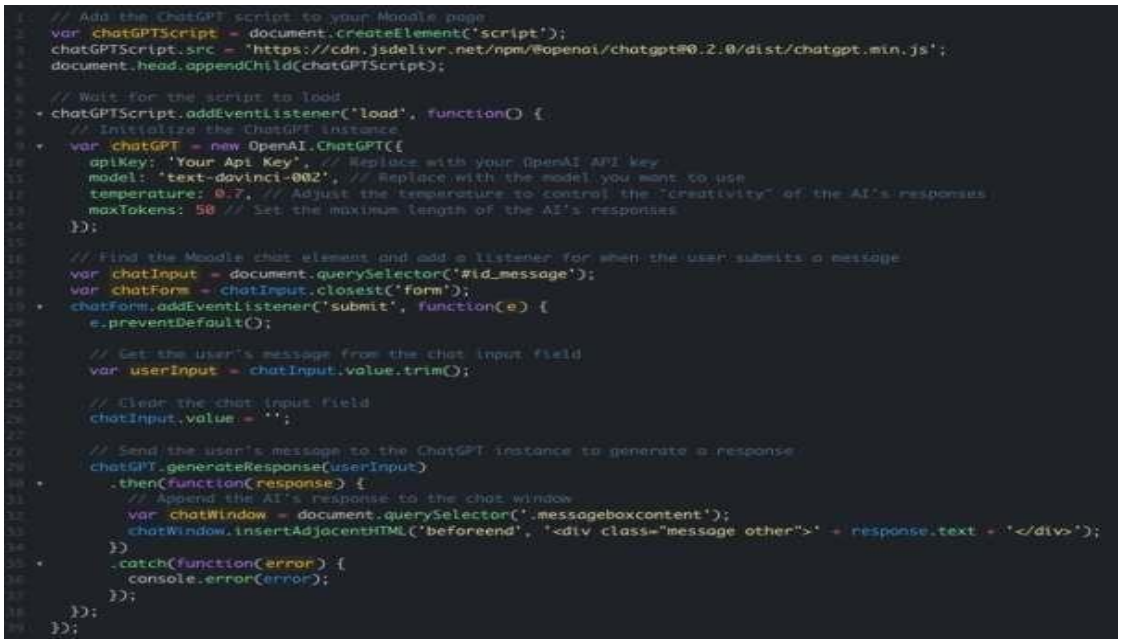
Chat GPT (GPT-3) was chosen in integrating AI into LMS. To integrate Chat GPT (GPT-3) into Moodle, it's important to remember that the GPT-3 API should be used to generate text according to requests and parameters. In principle, the steps that can be followed to integrate GPT-3 with Moodle are as follows:

1. Researcher registration: Register to obtain an API key on the OpenAI website (https://beta.openai.com/signup/).
2. Define the Purpose of Use: In this phase, the researcher determines how and for what purpose GPT-3 will be used in Moodle. GPT-3 can be used to create summaries of reading materials, generate multiple-choice questions, or provide personalized feedback for students.
3. Create a Prompt: Once specific tasks are decided for using GPT-3, a prompt needs to be created for the model. A prompt is a brief text that defines the task and provides the necessary context or information for the model to generate text. For example, if GPT-3 is to be used to create multiple-choice questions, the core part of the question, placeholders for

the correct answer, and incorrect answers need to be specified in the prompt.

4. Use the GPT-3 API: After creating the prompt, the GPT-3 API can be used to send this request to the model and receive the generated text as a response. This API allows various parameters to be set, such as the length of the generated text and the confidence level required for the model to provide a response.
5. Integration into the LMS: In the final stage, the generated text can be appropriately used within Moodle. For instance, the created multiple-choice questions can be incorporated into quizzes or exams, or the generated summaries can be used as part of reading assignments.

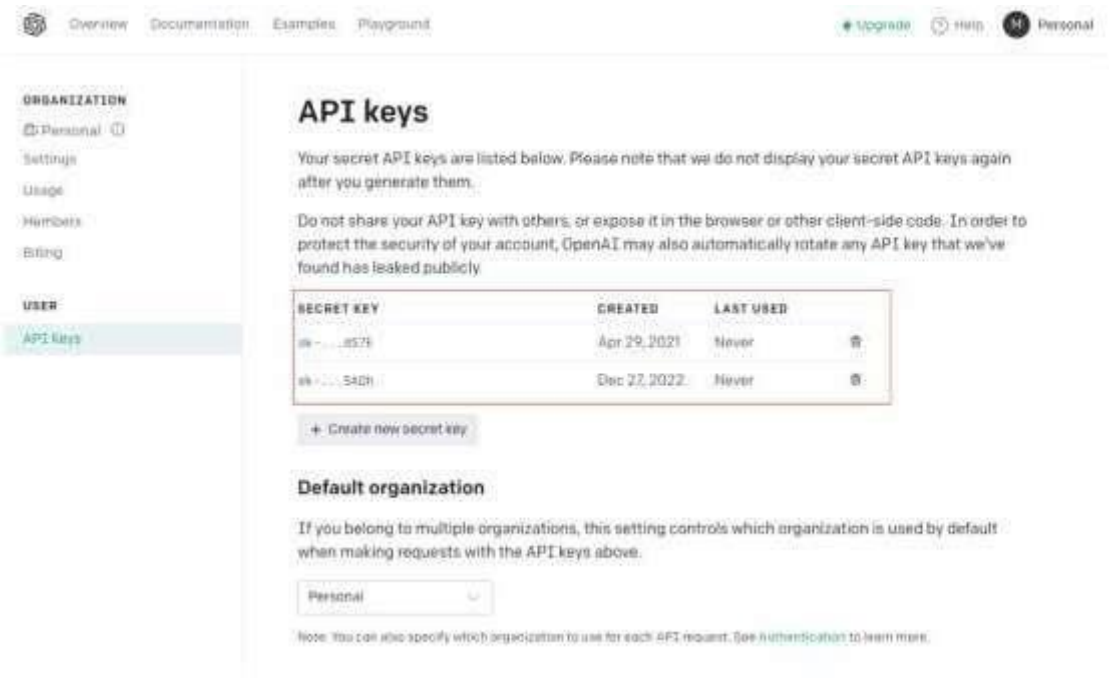
To integrate GPT-3 into Moodle, it is necessary to specify the code for sending requests to the GPT-3 API and receiving the generated text as a response. In this case, the JavaScript programming language is used for this development research. The JavaScript code used to integrate Chat GPT into a Moodle page can be seen in Figure 1 below.



```
// Add the ChatGPT script to your Moodle page
var chatGPTScript = document.createElement('script');
chatGPTScript.src = 'https://cdn.jsdelivr.net/npm/@openai/chatgpt@0.2.0/dist/chatgpt.min.js';
document.head.appendChild(chatGPTScript);

// Wait for the script to load
chatGPTScript.addEventListener('load', function() {
  // Initialize the ChatGPT instance
  var chatGPT = new OpenAI.ChatGPT({
    apiKey: 'Your Api Key', // Replace with your OpenAI API key
    model: 'text-davinci-002', // Replace with the model you want to use
    temperature: 0.7, // Adjust the temperature to control the "creativity" of the AI's responses
    maxTokens: 50 // Set the maximum length of the AI's responses
  });

  // Find the Moodle chat element and add a listener for when the user submits a message
  var chatInput = document.querySelector('#id_message');
  var chatForm = chatInput.closest('form');
  chatForm.addEventListener('submit', function(e) {
    e.preventDefault();

    // Get the user's message from the chat input field
    var userInput = chatInput.value.trim();

    // Clear the chat input field
    chatInput.value = '';

    // Send the user's message to the ChatGPT instance to generate a response
    chatGPT.generateResponse(userInput)
      .then(function(response) {
        // Append the AI's response to the chat window
        var chatWindow = document.querySelector('.messageboxcontent');
        chatWindow.insertAdjacentHTML('beforeend', '<div class="message other">' + response.text + '</div>');
      })
      .catch(function(error) {
        console.error(error);
      });
  });
});
```

Picture 1.
Coding Using JavaScript

The code above initializes ChatGPT with the OpenAI API key and the desired model. It then adds a user to the Moodle chat input column. When the user sends a message, the code sends that message to ChatGPT to generate a response. Subsequently, it adds the AI-generated response to the chat window.



Picture 2.
OpenAI GPT-3 API keys
(https://platform.openai.com/account/api-keys)

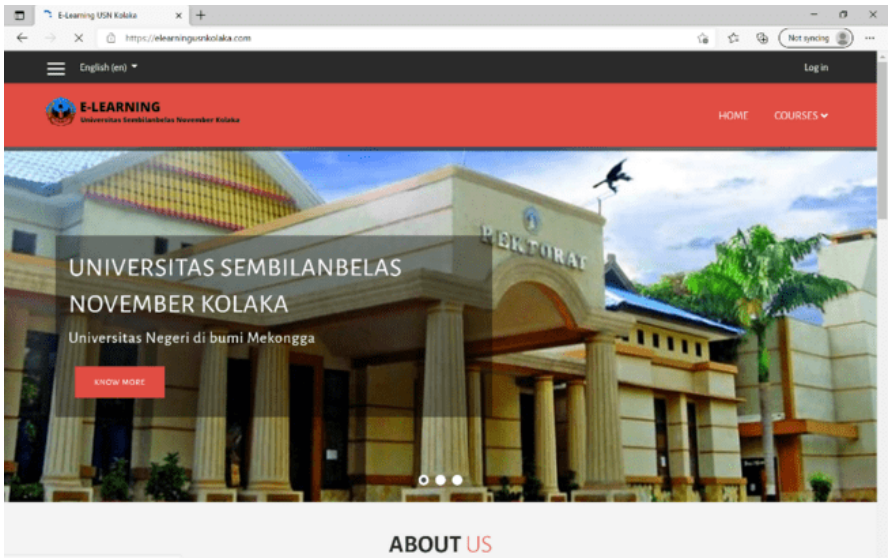
When configuring OpenAI ChatGPT in Moodle, the researcher will create scenarios of various questions and answers in the "Source of truth" column as part of the AI language programming process. This is to train the chatbot to respond to various potential questions and responses in the LMS chat column. In this context, a set of questions and answers will be designed to train the chatbot. As a result, when users ask questions using the ChatGPT window, they will receive contextually relevant answers on the Moodle platform.

The user permission access in the system is explained in the following table:

Table 3.
User Access Distribution

User	Description
Guests	Guest users have access to reading and can be considered as observers.
Students	Student users are participants in college and can access all of the lecture materials according to the courses they have taken.
Teacher	This user is an educator staff that become the administrator.
Administrator	A user with the highest access and authority in the system.

The display design of e-learning has been carefully modified to be as interesting and user-friendly as possible, ensuring that users feel comfortable while using the e-Learning portal. On the home page, menus and blocks were created to facilitate users' access to the e-Learning portal. Picture 3 depicts the appearance of the home page of the e-Learning portal.



Picture 3.
E-Learning Portal

Data Evaluation Analysis

An online questionnaire is administered to users for evaluation after using E-Learning. The analysis of the questionnaire's scores for each examined indicator can be observed in the following tables. Tables 4 to 9 provide the score analysis of the online questionnaire for evaluating different aspects of user experience with the E- Learning platform. The scores are categorized based on the indicators and question items, and the percentages indicate the level of satisfaction for each category.

Table 4.
Questionnaire's score analysis for User Satisfaction

Indicator sub	Interested to use	Want to use	Total
Question Item	4	5	
∑ Skor	47	51	98
Percentage	78%	85%	82%
Categories	GOOD	GOOD	GOOD

This table shows the score analysis for indicators such as "Interested to use" and "Want to use." The overall user satisfaction percentage is 82%, indicating a "GOOD" level of satisfaction.

International Journal of Education, Social Studies, And Management (IJESSM)
Volume 4, Issue 3, October 2024
Page 917-931

Table 5.
Questionnaire's score analysis for *Usability*

Indicator sub	**Easy to learn**	**mistake frequecy**	**Total**
Question Item	**6**	**10**	
∑ Skor	44	47	91
Percentage	73%	78%	76%
Categories	ENOUGH	GOOD	GOOD

The table presents the score analysis for indicators like "Easy to learn" and "Mistake frequency." The overall usability percentage is 76%, signifying a "GOOD" level of usability.

Table 6.
Questionnaire's score analysis for *Graphic design*

Indicator sub	***Graphic Design***			**Total**
Question Item	**9**	**11**	**15**	
∑ Skor	48	50	47	145
Percentage	80%	83%	78%	81%
Categories	GOOD	GOOD	GOOD	GOOD

This table displays the score analysis for the "Graphic Design" indicator. The overall graphic design satisfaction percentage is 81%, indicating a "GOOD" level of satisfaction.

Table 7.
Questionnaire's Score Analysis for *Navigation*

Indicator sub	***Navigation***	**Total**
Question Item	**7**	
∑ Skor	45	45
Percentage	75%	75%
Categories	ENOUGH	ENOUGH

The table provides the score analysis for the "Navigation" indicator. The overall navigation satisfaction percentage is 75%, signifying an "ENOUGH" level of satisfaction.

Table 8.
Questionnaire's score analysis for *Content*

Indicator sub	***Content***				**Total**
Question Item	**1**	**2**	**3**	**8**	
∑ Skor	50	50	49	48	197

Percentage	83%	83%	82%	80%	82%
Categories	GOOD	GOOD	GOOD	GOOD	GOOD

This table presents the score analysis for the "Content" indicator, with individual scores for question items 1, 2, 3, and 8. The overall content satisfaction percentage is 82%, indicating a "GOOD" level of satisfaction.

Table 9.
Questionnaire's Score Analysis for *Individual Impact*

Indicator sub	**Motivation**	***Problem Solving***	**Technology responsivity**	**Total**
Question Item	**13**	**12**	**14**	
∑ Skor	49	50	52	148
Percentage	82%	83%	87%	82%
Categories	GOOD	GOOD	GOOD	GOOD

This table displays the score analysis for indicators like "Motivation," "Problem Solving," and "Technology Responsivity." The overall individual impact satisfaction percentage is 82%, signifying a "GOOD" level of satisfaction.

This research has resulted in the creation of an e-Learning portal built using MOODLE LMS and ChatGPT. The development of e-Learning content packages followed the SCORM standardization guidelines. All prepared learning packages were then compiled into Content Aggregation Packaging and uploaded into the MOODLE LMS. To assist students in accessing the materials effectively, appropriate categories and subcategories were created in the lecture management section of MOODLE. The lecture format in MOODLE was tailored to match the type of material created. The Learning Module was designed with a topic format to allow students to access the material at any time that suits them (Sahidu et al., 2020). On the other hand, the Subject Presentation adopted a Weekly format, facilitating lecturers in delivering coherent material each week, which can be followed by students according to their weekly meetings. All learning materials can be saved and used as study references at home. Through the e-Learning portal, Mesikolah.com, students can benefit from a well-structured and accessible platform, enhancing their learning experience and promoting self-directed learning. Lecturers can efficiently manage course materials and deliver content in an organized and cohesive manner, promoting effective teaching and learning processes (Yawan, 2022). Overall, the e-Learning portal represents an essential tool in modern education, empowering both students and educators to engage in a dynamic and interactive learning environment.

The content creation process in E-Learning content packages adhered to the SCORM standardization. After organizing all learning packages, they were compiled into Content Aggregation Packaging and uploaded into MOODLE LMS. Properly categorized and subcategorized lectures in MOODLE's lecture management feature aid students in following the material effectively. The class format in MOODLE was tailored to match the type of content created. The learning module utilized a topic format, allowing students to access materials at their convenience (Oproiu, 2015). On the other hand, the course presentation adopted a weekly format, making it easier for lecturers to sequentially share material presentations each week, and students can follow the sequence accordingly . All learning materials can be downloaded and used for self-study purposes. The availability of downloadable materials enhances students' learning experience, allowing them to review and engage with the content even beyond class sessions (Halil, Nasruddin, Sejati, & Sugiarto, 2023). Through this systematic approach to content creation and delivery, the e-Learning platform promotes effective teaching and learning processes, empowering both students and educators to access and engage with educational materials in a flexible and convenient manner (Benta, et al., 2014; Chang, 2016).

The E-Learning package's results have qualified as a learning content package created according to the SCORM standardization, meeting the following criteria. The E-Learning portals are easily accessible online and equipped with search engines, allowing users to find every component in the Content Aggregation Package effortlessly. The sequential arrangement of materials ensures users can follow the content seamlessly. The materials in the Content Aggregation Package have been customized to align with the accepted curriculum and correspond with the course syllabus. The package demonstrates efficiency and productivity, especially when used on a large scale. Once produced, the Content Aggregation Package can be reused without the need for reproduction, leading to cost and time savings in material redevelopment. Any development can be easily followed by repackaging, eliminating the need to create from scratch, configure, or undergo a time-consuming re-storage process. The SCORM Repository serves as a medium to store and retrieve all available Content Aggregation Packages, making them accessible and reusable on various LMS platforms with different tools and platforms. Moreover, the SCORM Repository is accessible to anyone, facilitating the use of SCORM 2004 format on other compatible LMS systems. In addition, the customized hierarchical arrangement provides easy access to learning materials and allows for seamless additions without altering the context. The material arrangement can be

modified as needed without affecting the existing content, ensuring ease of reuse and adaptability.

The data from the questionnaire provided valuable feedback from users and served as a formative evaluation for the development of this E-Learning model. The analysis of the questionnaire in Table 4 revealed a high user satisfaction percentage of 82%, indicating that students generally showed excitement and interest in the E- Learning system. Usability, which assesses the ease of access to materials, is a crucial aspect in determining the effectiveness of an E-Learning package. The analysis in Table 5 showed a good usability score of 76%, indicating that students found it easy to access and study the materials, and the frequency of errors generated by the system was low. Graphic design plays a significant role as it influences users' visual satisfaction. Table 6 indicated that the graphic design of the E-Learning portal falls within the good category, with 81% satisfaction, implying that users were content and found the platform easy to navigate as a learning tool. However, in the navigation aspect 6, it scored 75% with the label "ENOUGH." This suggests that the navigation system of the MOODLE LMS might be considered complex by users. Overall, the formative evaluation based on the questionnaire data demonstrated positive outcomes for user satisfaction, usability, and graphic design, while highlighting the need for potential improvements in the navigation aspect to enhance user experience further.

The learning materials must be tailored to the course syllabus. The analysis of the questionnaire in Table 7 reveals that 82% of respondents rated the content as meeting the "GOOD" criteria. They found that the material provided by this E-Learning model aligns well with the course study, is comprehensive and well-structured, and proved to be beneficial in understanding the architectural concepts of the computer systems course. Table 8 presents an analysis of the Individual Impact factor. In this category, the percentage is 82%, indicating that users (students) were motivated to study the materials provided through this E-Learning model. Additionally, the model significantly helped them solve problems they encountered during face-to-face classes (83%). Moreover, using this E-Learning model, students became more aware of technological developments in their daily lives (87%). Overall, the formative evaluation through the questionnaire demonstrates the positive impact of the E-Learning model on students' motivation, problem-solving skills, and awareness of technological advancements (Saputra, Halil, Sukariasih, & Erniwati, 2022). It also confirms that the content aligns well with the curriculum and proves to be a valuable and helpful resource for students in their studies.

CONCLUSION

The development of AI-based e-Learning has resulted in an accessible online portal. The e- Learning content package successfully adheres to SCORM standardization, meeting the criteria of Accessibility, Adaptability, Affordability, Durability, Interoperability, and Reusability. The formative evaluation affirms that the research aligns well with the chosen approach, the ADDIE model. Meanwhile, the summative evaluation indicates that users' feedback for this e-Learning platform meets the "GOOD" criteria, with a satisfaction percentage of 80%. In conclusion, the implementation of this e-Learning portal represents a significant advancement in educational technology, ensuring easy access, adaptability, and cost-effectiveness, while providing a durable and reusable platform for educational content. The positive feedback from users further underscores the success of this development, encouraging its continued use and potential for further enhancement in the future.

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