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Building a Digital Learning Hub: Moodle-Based E-Learning for Sekolah Penggerak in Kolaka Utara

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ABSTRACT

Moodle serves as a valuable platform for creating online courses, training, and internet-based education while supporting essential e-Learning content distribution standards, specifically referring to SCORM. This research pursues three primary objectives: (1) the development of Moodle-based e-Learning in SMPN 4 Kolaka Utara, (2) the development of a MOODLE-based e-Learning content package adhering to the SCORM standard, and (3) the comprehensive evaluation of the Moodle-based e-Learning development process. Adopting the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) approach, the outcome of this research is the establishment of an innovative E-learning platform, named mesikolah.com, accessible online via <https://mesikolah.com/>. These courses meet the stringent SCORM standardization criteria, including Accessibility, Adaptability, Affordability, Durability, Interoperability, and Reusability. Formative evaluation results demonstrate a strong alignment with the chosen research approach, ADDIE, while the summative evaluation reveals positive user feedback, with an impressive 80% satisfaction rate on the e-Learning platform. Although this research focuses on the e-Learning development stage and content package preparation, further investigations are warranted, such as classroom action research. Notably, the current content package predominantly comprises text and flash presentations, necessitating future development of diverse media types, such as video on demand or video streaming.

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INTRODUCTION

The Covid-19 pandemic, which has affected the world for the past 3 years, has significantly impacted the education sector, leading to a decline in students'

learning quality (Shahid et al., 2020; Lestari & Gunawan, 2020). Indonesia, including Southeast Sulawesi Province, especially North Kolaka Regency, has also experienced severe consequences in its education sector due to Covid-19. To curb the spread of the virus, many local governments have made the tough decision to close schools and universities (Ristekdikti, 2020). As a result, online learning or limited face-to-face learning has become the primary mode of education. Some authorities have even extended this period of online learning and limited face-to-face interactions until the situation with COVID-19 improves. In North Kolaka Regency, for instance, the Education Office implemented a policy to extend students' learning time at home. During this pandemic emergency period, the traditional learning system has been replaced by online learning to ensure the continuity of education (Sintema, 2020; Sukmawati, et al., 2022).

This shift in learning patterns demands that teachers and education developers provide digital learning materials and engage students through remote digital devices, utilizing technology effectively (Usak et al., 2020; Pereira, & Guerreiro, 2021). For schools that have adopted limited face-to-face learning, the integration of technology can facilitate blended learning approaches. It is crucial for educators to adapt to this new reality and leverage technology to enhance students' learning experiences, regardless of the mode of instruction. Embracing innovative teaching methodologies and creating engaging digital content can help students thrive in this challenging period. The post-pandemic education landscape is likely to be influenced by the lessons learned during this time, emphasizing the importance of technology and blended learning in modern educational practices. The rapid development of information technology has opened up new opportunities for learning innovation, making education more flexible and accessible anywhere and anytime (Ristekdikti, 2020). As highlighted by Lestari & Gunawan (2020), computer technology enables a combination of face-to-face and online learning, presenting educators with various approaches, strategies, techniques, and equipment to consider for effective implementation. Information technology can be seamlessly integrated into an active learning approach, with Moodle-based Learning Management System (LMS) being a prominent example. LMS stands out as one of the most effective approaches to learning, making it a valuable resource for both teachers and students, driving the need for its widespread integration (Sintema, 2020; Garrison, 2011).

SMP Negeri 4 Kolaka Utara, the focus of this research, currently lacks an LMS platform to support its learning processes. Despite having a technologically supportive infrastructure, learning activities are still conducted

conventionally through limited face-to-face meetings. To enhance the learning experience and align with the spirit of Merdeka Belajar (Freedom of Learning), it becomes imperative to develop a website-based LMS for the school. The proposed LMS system will provide various functionalities, such as uploading learning materials, creating quizzes and questions, establishing discussion forums, and managing students' progress. By integrating face-to-face and online learning through LMS, a blended learning system will be formed. This approach combines the benefits of traditional face-to-face teaching with the virtual classroom experience, enriching the overall learning environment (Llerena-Izquierdo, 2022). The introduction of online learning through this innovative LMS platform is expected to significantly increase the effectiveness of learning at SMP Negeri 4 Kolaka Utara. Students will have access to a more diverse range of learning resources and opportunities for interactive engagement, promoting a more dynamic and flexible learning process. With the integration of technology in education, students can learn at their own pace, engage in collaborative discussions, and receive personalized support from teachers (Gal & Israel-Fishelson, 2020). Moreover, teachers can effectively track students' progress, provide timely feedback, and adapt their teaching strategies to suit individual learning styles.

Based on the description provided, the purpose of this study is to develop an LMS platform to support face-to-face learning at SMPN 4 Kolaka Utara. The outcomes of this research will aid SMPN 4 Kolaka Utara in their school digitization efforts, particularly in terms of technology-based learning management. This will empower teachers to enhance the overall quality of learning, especially during the challenging times of the Covid-19 Pandemic and the post-pandemic era, leading to more effective and engaging learning experiences.

RESEARCH METHOD

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 teachers at SMP Negeri 4 Kolaka Utara. 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 teachers' opinions at SMP Negeri 4 Kolaka Utara 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
<i>User satisfaction</i>	2
<i>Usability</i>	2
<i>Graphic design</i>	3
<i>Navigation</i>	2
<i>Content</i>	3
<i>Individual impact</i>	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:

$$P = n \times 100 \&$$

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. The e-Learning portal was named "mesikolah.com," derived from the local language of the Tolaki- Mekongga, the local language of the area where SMP Negeri 4 Kolaka Utara school is located. The word "mesikolah" signifies "to go to school." By considering the specific needs and context of the school, the development of mesikolah.com aimed to create an effective and user-friendly e-Learning platform. Its implementation will support the school's educational objectives and enhance the learning experience for both teachers and students (Dhika, et al., 2020)

The display design of mesikolah.com 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 1 depicts the appearance of the home page of the e-Learning portal.

Picture 1.
Portal of Mesikolah



Before accessing the contents of the e-Learning portal, every user must log in to the system to gain access to the provided menus. This user login serves the purpose of managing user access rights based on the authority set by the Administrator. To log in, users can use the login menu on the front page. Additionally, users have the option to choose between Indonesian and English as their preferred language. The process of adding users can only be performed manually by the Administrator to ensure proper control over user management. This allows the Administrator to maintain oversight and control over user accounts and access privileges effectively (Shurygin & Sabirova, 2017).

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 preparation of the course content package was organized according to the guidelines for creating the Content Aggregation Package. To ensure ease of accessibility and usability for both teachers and students, the subject content packages were divided into two parts, namely learning module and course presentation.

Learning Module

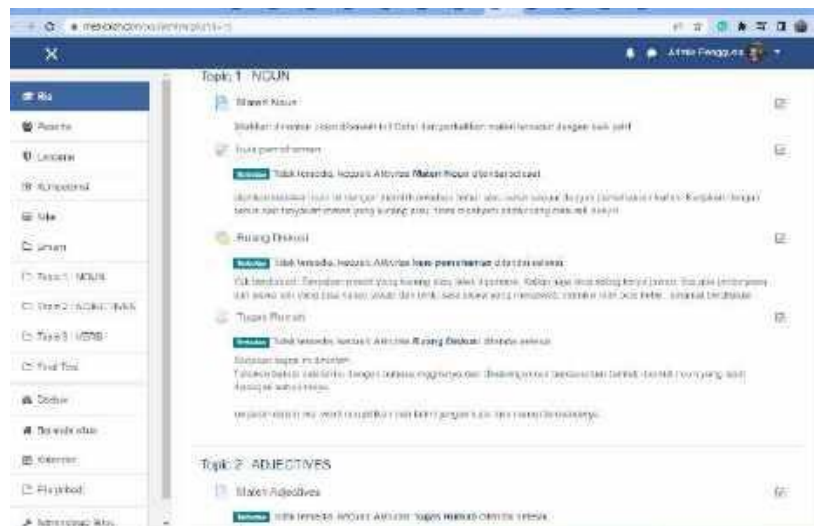
The Learning Module was divided into two Content Aggregation Packages, namely Summaries and Subject Modules. The Summaries were further divided into 10 materials, while the Subject Modules were divided into 7 Chapters. All assets in this Content Aggregation Package were in text files in PDF format, enabling students to access them directly online and save them as self-study materials. Picture 2 displays the Content Aggregation Package of the learning module.

Picture 2.
Content Aggregation Package



Course Presentation

The Subject Presentation was arranged based on the number of meetings for each subject. The preparation of the learning content packages followed the school semester program, ensuring that each meeting had its own dedicated Content Aggregation Package. Picture 3 illustrates the Content Aggregation Package of the Subject Presentation.



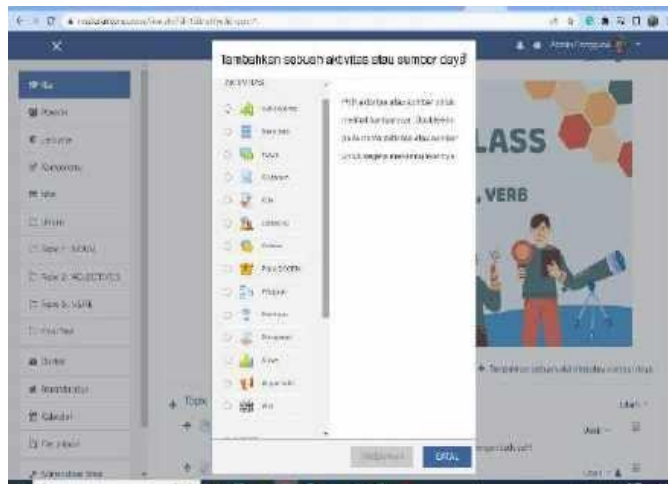
Picture 3.

Content Aggregation Package of the Subject Presentation

In the course syllabus category, the course format follows a topic format with the Satuan course syllabus.pdf file. In the learning module category, there are two SCORM Content Aggregation Packages that use the course with a topic format as well. To simplify the college maintenance process, the presentation format was set up using a weekly format. The weekly format was chosen because it allows for setting specific starting and ending dates for each material. During each meeting, learners have the option to either view the presentation online through the e-

Learning portal using a browser or download the material in PowerPoint format for independent study. This flexibility enables students to access the course materials based on their preferences and learning pace.

Picute 4.
Learning Activity Tools



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.

Table 5.
Questionnaire's score analysis for Usability

Indicator sub	Easy to learn	Mistake Frequency	Total
Question Item	6	10	
\sum 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	
\sum 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	
\sum 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	
\sum 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	
\sum 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.

Discussion

This research has resulted in the creation of an e-Learning portal named Mesikolah.com, built using MOODLE LMS, and accessible online at <https://mesikolah.com/>. 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 e-Learning has resulted in an accessible online portal named "Masikolah," accessible through the address <http://masikolah.com>. 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, Masikolah, 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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