

Analysis of Web-Based E-Learning Management System Business Proccess to Increase Learning Effectiveness at SMA ABC Bandung

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ABSTRACT

The results of the review of the implementation of differentiated learning activities at SMA ABC Bandung which are in accordance with the vision of an independent curriculum based on a digital school as well as the diverse characteristics of students at SMA ABC Bandung support the development of a digital technology-based learning management system with the E-Learning Management System of SMA ABC Bandung which is built in 2020 in line with the LFH (Learning From Home) learning scheme. This supports innovation and creation in the development of digitalization-based learning in this school. This research aims to evaluate the design of E-Learning products that use Moodle as a platform, with a focus on the product's ability to increase the effectiveness of differentiated learning at SMA ABC Bandung. This research uses a Research and Development approach with a one group pre-test post-test design. The samples for this research were students in classes X, XI, XII and several E-Learning Management System operators at SMA ABC Bandung. Based on the results of the existing design analysis, it can be seen and concluded that the E-Learning Management System application for SMA ABC Bandung has good effectiveness. In this way, it can be utilized effectively by all school components that use it.

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INTRODUCTION

In order to improve the quality and effectiveness of learning, especially at the high school level in West Java province, developments in science and technology are currently very necessary in the world of education. The policy that regulates the harmonization and pairing of digital technology for upper secondary level students in West Java province, especially at ABC Bandung High School, demands that teachers and teaching staff continue to increase the legal mutualism in interacting and using information and communication technology. This is stated in all differentiated learning and teaching methods at SMA ABC Bandung which encourage the development of digital-based schools in accordance with the vision and mission of the independent curriculum project to strengthen the profile of Pancasila students and Masagi schools 2023 at SMA ABC Bandung

In connection with the above, the entire teaching and learning process carried out at SMA ABC Bandung requires integration into an E-Learning Management System which was initiated at the beginning of the COVID-19 pandemic and is based on LFH (Learn From Home). The use of E-Learning should have a good impact on the teaching and learning process at SMA ABC Bandung, that is why the author describes several business processes for the performance flow of the E-Learning Management System which is implemented and used at SMA ABC Bandung as a reference in carrying out and implementing differentiated learning in accordance with the curriculum vision berdeka which is based on a digital school.

Currently, the E-Learning Management System as one of the learning media implemented at SMA ABC Bandung, has not been used optimally by all existing teachers and educational staff, while in several schools in West Java province many have used and implemented the features. which is in the E-Learning Management System with a system developed from various school backgrounds in West Java province. Based on the background above, several problem formulations can be formulated as follows:

1. How is the E-Learning Management System (ELMU) design implemented at SMA ABC Bandung?
2. What is the business process for using the E-Learning Management System implemented at SMA ABC Bandung?

LITERATURE REVIEW

E-Learning

E-Learning is an educational innovation that is used in the classroom and outside the classroom. This term consists of two words: "E-Learning", which means "electronic", which means "objects made with electronic principles", and "Learning", which means "learning" or "learning". Therefore, E-Learning can be explained as a learning or learning



method that involves the use of electronic devices such as computers. Kamarga (2000) also stated a similar concept regarding E-Learning, namely that learning material is accessed via computers or electronic devices during the learning process. E-Learning (Modular Object-Oriented Dynamic Learning Environment) is one of the most popular LMS used in formal and non-formal educational institutions in Indonesia.

E-Learning (Moodle) is a web-based learning application that offers several features (especially H5P) in the form of subject classes designed as a place to download learning videos (media), handouts, learning materials, subject questions, slides (documents) presentations and opinion or opinion forums based on discussions. Thus, E-Learning can be understood as the use of Learning Management System (LMS) based software as a tool to support electronic learning (Luh Aristya Dewi et al., t.t.).

According to (Hidayati, 2010) E-learning is an educational concept that utilizes information and communication technology in the teaching and learning process. It can be concluded that E-Learning is an educational concept that is applied by combining learning with the internet, providing various digital interactions between learning participants. Research conducted (Afrianti & Zainul, 2021) shows that e-learning products have very high validity for use as learning materials for students in high schools and Madrasah Aliyah, especially in Basic Chemical Law material.

E-Learning Management System

The learning cycle must be adjusted to keep up with the times and progress in the world of education. This is driven by the transition from manual to digital learning. This is where a new innovation emerged known as an Electronic Learning Management System, or LMS. The very rapid development of Learning Management Systems (LMS) has encouraged the emergence of new ideas to overcome interoperability problems between various existing LMS by adopting certain standards. Some examples of standards that have been implemented include standards released by AICC (Airline Industry CBT Committee), IMS, IEEE LOM, ARIADNE, and so on (Hidayati, 2010).

The use of Learning Management Systems (LMS) has been implemented in various educational institutions, including middle and high schools, to support the learning process. Various studies have been carried out regarding the implementation of LMS in several schools. For example, Hardyanto (2016) and Zyainuri (2012) conducted research related to the application/implementation of LMS in vocational schools. Meanwhile, Pratiwi (2014) conducted research on the implementation of LMS in junior high schools for special subjects. Other research shows that LMS can be implemented in middle and high schools (Wibawa, Waspada, & Wirawan, 2017). Research conducted by Hardyanto (2016), Zyainuri (2012), Pratiwi (2014), and Wibawa (2017) discusses the implementation of electronic learning in schools, but does not explain how LMS can manage classes in middle and high schools in general, including schools with many classes in one year. Information about classroom management in LMS is very important for middle and high schools so they can adopt LMS in their school environment (Indra Gunawan et al., n.d.).

Aplikasi E-Learning berbasis web

The development of a globally integrated E-Learning Management System via the web has encouraged the creation of innovative new features in the E-Learning used. From the student enrollment process, material input, interaction via forums, uploading and downloading learning materials to H5P interaction in the learning scheme implemented.

Dokeos is a web-based E-learning Management System application that is released for free under the GNU GPL license and is supported by many countries around the world in its development. As part of the education management system, the operating system is certified. Distribution of study materials, scheduling, monitoring learning progress, communication via text, audio, and video, exam administration, and record keeping are elements contained in its content. Dokeos strives to be a simple, flexible and user-friendly system (Hidayati, 2010).

System Development Lyfe Cycle (SDLC)

System Development Life Cycle (SDLC) is a logical process used by system analysts to develop information systems. This process includes requirements, validation, training, and system owner (Luh Aristya Dewi et al., n.d.). SDLC is the process of developing or modifying applications or software systems using several models and methods that have been used previously for developing software systems. SDLC is used in designing or developing an information system to solve problems effectively and efficiently.

SDLC is a modeling cycle and methodology for designing or developing information systems. This cycle consists of system requirements, validation, training, and system owner, and aims to solve the problem.

PPSUQ (Post Study SystemUsability Quesionnaire)

The Usability Measure consists of 16 statement items which are divided into four categories, namely system usability, information quality, interface quality, and overall satisfaction. There is a rating scale of 1 to 7 points on the PSSUQ, and a scale of 1 to 7 points is included in the Semantic Differentiation Scale category, namely a statement scale in a survey where respondents are asked to calculate the average of their opinions between 2 linear scale points. and theoretically there are 7 rating points.

On this scale, it is explained that the lowest score in this study starts at a value point of 1, defined as completely agreeing with the statement in the questionnaire, and continues to the next value point, up to a value point of 7, defined as strongly disagreeing. statements contained in the questionnaire. statements included in the questionnaire. Evaluation of usability testing on the PSSUQ will be considered through the results of the average score for each subscale category included in the PSSUQ questionnaire. (Luh Aristya Dewi et al., n.d.)

Black Box Testing

The "Black Box Testing" method is a test used to find out whether all system functions in the application or software can run well and meet the requirements to function properly. There are several types of Black Box testing methods based on the opinion of Julian (2015), including equivalence testing, boundary type of testing, comparison testing, sample testing, endurance testing, and behavioral testing. test types, test types Performance testing, test types Requirements testing, test types Robustness testing and test types Cause and effect relationship testing.

METHOD AND DISCUSSION

This research was conducted in five implementation stages. These stages include identifying the problem, conducting literature research, conducting an application usability test (Usability Test), analyzing the results of the processed questionnaire, and then checking the results and making conclusions. This research shows the framework in the form of a diagram which can be seen in the image below:

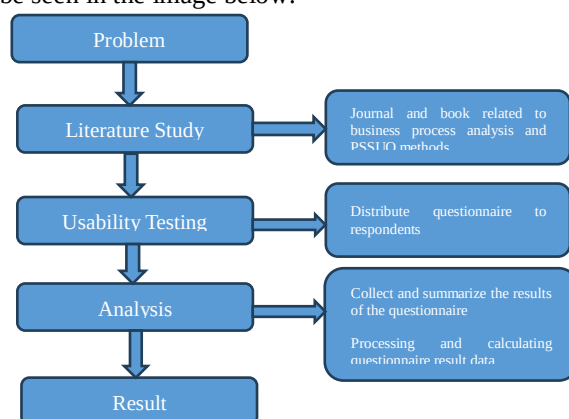


Figure 1. Research Framework

The problem recognition stage involves identifying problems faced by users in terms of usability or usability of the E-Learning Learning Management System (ELMU) application at SMA ABC Bandung. After identifying the problems that exist in the E-Learning Management System of SMA ABC Bandung, the next step is to carry out a literature study to obtain a theoretical basis from various sources, such as books and related research journals that have previously existed in this research topic.

The third stage is to test the usability of the ABC Bandung High School E-Learning Management System (ELMU) application. In this step, a questionnaire containing ten PSSUQ questions was distributed to 398 respondents at SMA ABC Bandung. With Usability, Overall, Sysuse, Infoqual, and Interqual tests on the E-Learning Management System (ELMU) SMA ABC Bandung. The calculation results from the questionnaire were analyzed using a Likert scale as a measuring tool for this research. Therefore, PSSUQ has the principle that the lower the score, the higher the utility, meaning that the smaller the score achieved, the greater the utility value. The final stage involves the synthesis of results and conclusions from usability testing with the PSSUQ method using a Likert scale. In this step, researchers provide suggestions and recommendations for improvements in future research.

Participants in this research were users of the E-Learning Management System (ELMU) web application who were ABC Bandung High School Students and 2 Operators. The PSSUQ instrument in this research was given to 398 application users. The list of respondents to research on the E-Learning Management System (ELMU) application for SMA ABC Bandung can be seen in table 1.

Data or information collection in this research was carried out through a questionnaire method using the PSSUQ instrument, which aims to measure the Usability aspect of the E-Learning application. Each question instrument in the PSSUQ is initialized using P1 to P10. The ten PSSUQ questions can be grouped into 4 categories, namely overall satisfaction score (Overall), system usability (Sysuse), information quality (Infoqual), and interface quality (Interqual). The data can be seen in Table 2.

Table 1. ABC Bandung E-Learning Management System (ELMU) Application Users
 No ABC Bandung High School E-Learning Management System (ELMU) User Unit Number of User

1	Class X Students	132
2	Class XI Students	132
3	Class XII Students	132
4	Teacher	2

Table 2. PSSUQ calculation procedure in this study is as follows

Score Name	Average Item Respon
Overall Satisfaction	No item 1 s.d 10
Sysuse	No item 1 s.d 8
Infoqual	No item 6 s.d 10
Interqual	No item 9 s.d 10

Next, the researcher used a Likert scale model to produce a five-point score to determine the level of user agreement with the part of the question given. The results are then processed using descriptive statistical techniques, and overall, each parameter is evaluated, the criteria are as follows:

Table 3. Measurement categories on a Likert scale

Criteria	Point
Strongly Disagree (STS)	5
Don't Agree (TS)	4
Normal (BS)	3
Agree (S)	2
Strongly Agree (SS)	1

RESULT AND DISCUSSION

The scores for each instrument question were calculated and grouped into four categories of respondents who met the PSSUQ evaluation criteria: overall satisfaction (Overall), system usability (Sysuse), information quality (Infoqual), and interface quality. The PSSUQ score in this study produces an average mean score for the four categories in testing the usability of the E-Learning Management System (ELMU) web application system at SMA ABC Bandung, namely 1.99. From the results of calculating scores in the three categories of the PSSUQ instrument, the assessment for the system usability (Sysuse) category received the lowest average score of 1.92. The information quality category (InfoQual) has an average of 2.01, while the interface quality category (Interqual) has the highest average with a value of 2.02. Meanwhile, the average value for the overall satisfaction category (Overall) is 1.96

System Usefulness (Sysuse) is a factor included in the PSSUQ evaluation to evaluate whether system usability meets user needs. This category relates to relevance, significance, informativeness, significance and usefulness of information for user decision making. System quality has a positive relationship with usability and has a significant influence on the usability view of the ELMU system itself. The average for this category is 1.92, which is the lowest average of the other three aspects. This shows that in terms of usability, the "usefulness" category has a lower value than the other three aspects. PSSUQ has the principle of giving a lower score for high utility, that is, the smaller the score achieved, the greater the utility value.

Information Quality (infoqual) is a factor included in PSSUQ research which measures the quality of a system based on ease, accuracy, relevance and speed of presenting information. Satisfaction with the quality of information can refer to various aspects such as error messages that help resolve problems, the ability to quickly recover errors, clarity in the presentation of information by the application, ease in finding information, ease in understanding information, effectiveness of information in helping complete tasks, and appearance. clearly in meeting information needs. The average found for this category was 2.01.

Interface Quality (InterQual) is one of the assessment components in PSSUQ that evaluates aspects such as the visual appeal of the application and its ease of use. The median or average score in this category is 2.03. Interface

elements can influence user satisfaction when using an application, for example ease of use when navigating the application and quality of the interface. User interface design plays a key role in application development, and high-quality interface design can promote compatibility between devices. This compatibility has a significant impact on the ease of use associated with new technology.

The Overall Satisfaction Score (Overall) is an overall assessment of the PSSUQ tool which reflects overall user satisfaction. General satisfaction can be assessed based on an assessment of system usability, information quality, and interface quality. The mean value of the Overall Satisfaction category assessment in this study was 1.96. By calculating the average score for each category, an overall average score of 1.99 was found. This shows that users are generally quite satisfied with the use of the E-Learning Management System (ELMU) at SMA ABC Bandung.

The results of the analysis above were obtained based on the User Interface (UI) in the ABC Bandung High School E-Learning Management System (ELMU) application in Figure 2. to Figure 8.



Figure 2. E-Learning Management System Portal Page

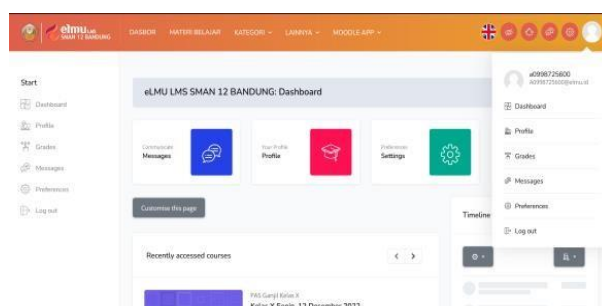


Figure 3. User (Student) Dashboard Page

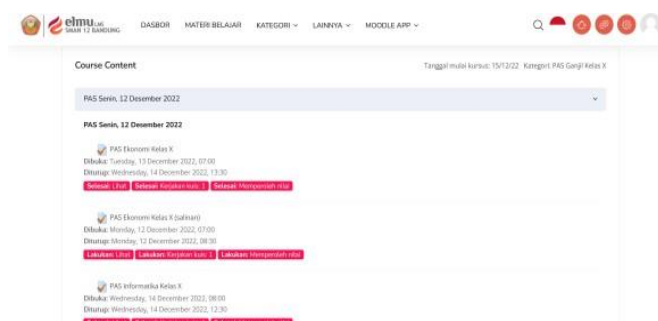


Figure 4. Course Activity (Students)

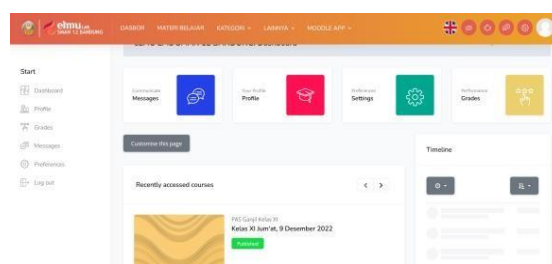


Figure 5. Teacher (Operator) Dashboard Page

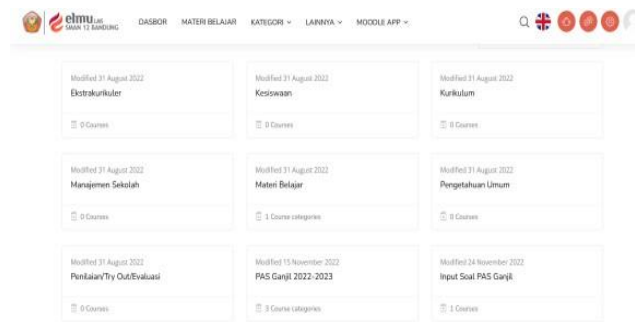


Figure 6. Course Teacher (Operator)

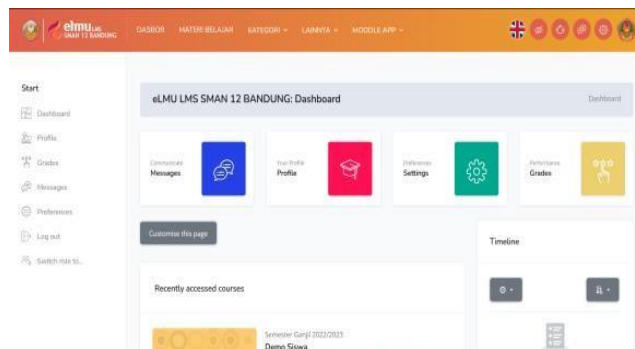


Figure 7. Admin (Operator) Dashboard Page

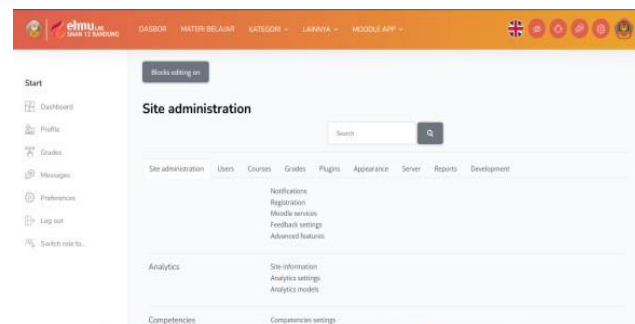


Figure 8. Site Admin (Operator)

Design Results

Based on the results of the design analysis carried out above, it can be seen that the E-Learning Management System (ELMU) application for SMA ABC Bandung has good effectiveness, so that it can be used well by all school components that use it. To improve service quality, the SMAN ABC Bandung IT team must test the usability of the E-Learning Management System application or web. Usability can be used as a performance evaluation tool for applications that have been created because it can provide a comprehensive picture of the user's experience when using a particular application or system.

One method or method that can be used to carry out usability testing is the Post Study System Usability Questionnaire (PSSUQ). PSSUQ is a questionnaire intended to measure and evaluate user satisfaction with a designed system. The PSSUQ includes ten items to evaluate four system features from a practical perspective. By utilizing the PSSUQ questionnaire instrument, developers can measure the level of user satisfaction with an application. The findings in this research are in line with the results of previous research, indicating an increase in the level of user satisfaction with the ELMU application after improvements to the application design implemented using the HCD method and the PSSUQ questionnaire.

System testing results using the Black Box Test Method

After the E-Learning Management System (ELMU) web application Information System has been installed successfully, the next stage is the testing stage. This stage is carried out using the Black Box test method to test whether the functions, input and output of the E-Learning Management System (ELMU) web application information system meet the requirements. This Black Box testing tests the information system specifications of the E-Learning

Management System (ELMU) web application from a functional point of view, without testing programming code. The following are assessment indicators tested using the Black Box method on the E-Learning Management System (ELMU) web application Information System. These indicators function as the scope or limits of testing the application functionality of the information system:

Table 4. Black Box Test Indicators

No	Indikator Yang Diuji Pada Sistem Informasi E-Learning
1	Testing access to the E-Learning Information System via a web browser (Chrome)
2	Data Input and Data Update Testing on the E-Learning Management System (ELMU) Information System Web Application
3	Testing functions and features on the E-Learning Management System (ELMU) Information System Web Application

The indicators described previously will be arranged in several testing stages in this step. The table below shows the parts that will be tested and the results of the test using the Black Box Testing method:

Table 5. Login Functionality Testing Indicators

No	Name	Output	Validity	Score
1	Sign In – Valid	User name, The password matches the validation and is successful	Y	100
2	Sign In – Not Valid	User name, The password doesn't matches the validation and is fails	Y	100
3	Forget Password	Input late password and reset password via email	Y	100
4	Change Password	Input late password and new password	Y	100
5	Log Out	Exit the system	Y	100

Table 6. Notification Functionality Testing Indicators

No	Name	Output	Validity	Score
1	Notification Click	Click the notification icon and display user notifications	Y	100

Table 7. Message Functionality Testing Indicators

No	Name	Output	Validity	Score
1	Click Message	Click the message icon and display new and old message	Y	100
2	Sent Message	Click the message icon, choose contact, then type and send message	Y	100

Table 8. Video & Image Viewer Functionality Testing Indicators

No	Name	Output	Validity	Score
1	Course Access	Click the course, then entered into course page	Y	100
2	Display Picture	Click the course, then entered into course page, click edit mode, add activity, choose h5p picture, save, display picture on class page, video can be accessed	Y	100
3	Display Video	Click the course, then entered into course page, click edit mode, add activity, choose h5p picture, save, display video on class page, video can be accessed	Y	100

Table 9. Virtual Face to Face Functionality Testing Indicators

No	Name	Output	Validity	Score
1	Course Access	Click the course, then entered into course page	Y	100
2	Create Virtual Class	Click the course, then entered into course page, click edit mode, add activity, choose jitsi, save, virtual class can be display on class page, virtual class can be accessed	Y	100
3	Join Virtual Class	Click the course, then entered into course page, choose jitsi, click access, participant enter the virtual class room	Y	100

Table 10. Forum Functionality Testing Indicators

No	Name	Output	Validity	Score
1	Course Access	Click the course, then entered into course page	Y	100
2	Create Forum	Click the course, then entered into course page, click edit mode, add activity, choose forum, save, forum can be display on class page, forum can be accessed	Y	100

Table 11. Attendance Functionality Testing Indicators

No	Name	Output	Validity	Score
1	Course Access	Click the course, then entered into course page	Y	100
2	Create Attendance	Click the course, then entered into course page, click edit mode, add activity, choose attendance, save,	Y	100

Table 12. Search Column Functionality Testing Indicators

No	Name	Output	Validity	Score
1	Search Column	Enter the homepage, type course name in search column, click search icon, course can be display	Y	100

CONCLUSION

Based on the results of research measuring usability on the E-Learning Management System (ELMU) web application at SMA ABC Bandung using the PSSUQ questionnaire method, it was concluded that in general, the E-Learning Management System (ELMU) web application at SMA ABC Bandung can be well received by users. (students, teaching staff and educational staff), both in terms of the usability of the ELMU application at SMA ABC Bandung (Sysuse), the quality of the information on the E-Learning Management System (ELMU) web application at SMA ABC Bandung (Infoqual), and the quality of the interface/UI on SMA ABC Bandung (Interqual) E-Learning Management System (ELMU) web application, as well as overall application satisfaction. It can be said that users (students, teaching staff and educational staff) are quite satisfied with the use of the E-Learning Management System (ELMU) web application at SMA ABC Bandung

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