



Innovation of Learning Management System in Mathematics Education Study Program as MBKM Supporting Media

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ABSTRACT

The main objective of this research is to produce an LMS that can support synchronous, asynchronous, and blended learning systems, especially in the Mathematics Education study program at Universitas Sembilanbelas November Kolaka (USN Kolaka). This LMS is essential because USN Kolaka currently does not have an independent LMS. At the same time, the existence of an LMS greatly supports the implementation of MBKM, especially in lecture programs outside the University. The LMS that will be created is an open-source-based LMS that also supports the use of the Woocommerce system. Specifically, the course that will be included in the system is the Mathematics Learning Media course. However, this LMS will be developed into an online mathematics learning center throughout Indonesia, starting from elementary school to university level. To develop this LMS requires several stages. The first stage is to analyze what essential materials will be included in the system first. Second, designing or designing the LMS interface and menu layout, including how to deliver the material; the third stage realizes what has been planned. The realization stage consists of product trials, evaluation, and revision. The last stage is the implementation stage. This stage of development is known as the Plompt model. From these stages, an open-source LMS that is suitable for use as an online learning platform is obtained. It can include various lesson materials. Especially for this research, the teaching materials included have also gone through a validation process so that both the material and the media are ready to be used for the teaching and learning process.

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1. INTRODUCTION

The Merdeka Learning Campus policy issued by the Ministry of Education, Culture, Research, and Technology has brought significant changes to the learning process in higher education. Through its programs, students from 3T areas can get the opportunity to study at renowned universities in Indonesia. They can also choose courses outside their study program as they wish. Not only that, the involvement of industry and society in the learning process can provide practical experience for students in preparing themselves to face the world of work.

Based on the MBKM implementation guidebook issued by the Ministry of Education in 2020, there are about eight items in the MBKM program. One of them is student exchange, which is an opportunity to study at another university that may have better facilities and infrastructure than the original campus. Being able to feel the atmosphere of education at a renowned university is a precious experience for students. In addition, this program supports the achievement of IKU 2, IKU 6, and IKU 7 in the university.

In practice, the opportunity to study at another university can be done in two ways: offline and online. For online lectures, of course, the receiving party must have an LMS facility that can help with learning management. However, if the lectures are conducted offline at the receiving campus, the sending campus should also have an LMS to facilitate the departing students. The curriculum structure in each university may be different so there may be compulsory courses at the home university that must be programmed by students but not at the receiving university. In order for students not to be left behind, the compulsory courses must be taken. To facilitate students, a Learning Management System (LMS) is needed.

Therefore, through this opportunity, an LMS will be developed that can later be used for the learning process in the Mathematics Education study program at Universitas Sembilanbelas November Kolaka. This LMS can support the implementation of the independent campus learning program, especially in the Mathematics Education study program. This LMS will provide learning facilities complete with evaluation tools. Furthermore, the LMS that will be developed can be commercialized or paid for outside students who try to access it so that it can provide income for the instructors / lecturers who teach the course. In addition to campus use, the LMS can be developed into an online course for those who need to understand more about math, from elementary school to college level.

Learning Management System (LMS) is a good solution for organizing learning in the network. This LMS can be in the form of web-based or android-based applications. There are many web-based and android-based software that can be used in the network teaching and learning process but not all fall into the LMS category. For example, WhatsApp, Facebook, Instagram and other social media can also be used to teach online but all of them are not LMS (Irfan, 2019)

An LMS at least provides material storage features, group communication features, personal communication, attendance and grade processing features because these features are very supportive of learning management. Some examples of LMS that have these facilities are Schoology, Microsoft Teams, modified goole classroom and Moddle (Ak. Nasrum & Subawo, 2022). All of these LMSs are web-based and are also available in the form of applications on android. Each of these LMSs has its own advantages.

Schoology, whose interface is similar to Facebook, makes it easy for users to understand its use. Even though there is no manual book, this LMS is very easy to use. The features available in it are very helpful in the course of learning well. One feature that is available in schoology but not in other LMS is the involvement of parents in the implementation of learning. Schoology provides a separate feature for parents to monitor

their children's progress in learning. However, the add-in for video conferencing cannot be used for free Schoology (Mashuri & Nasrum, 2020). This feature is needed to support the online learning process.

Furthermore, Microsoft Teams is an online learning platform provided by Microsoft corporation. All the main features required by an LMS are present on this platform. The main advantage is that it has a very large file storage facility for each account which is 1 TB. Another advantage is that it is equipped with communication facilities both in groups and personally, text or voice, video calls or telephone calls, all in one platform. Microsoft Teams is an LMS that has complete features, but unfortunately the quiz-making platform is still very standard as in google forms (A. Nasrum & Subawo, 2021).

Apart from Microsoft, other large companies such as Google Corporation have also developed a platform to help the online learning process, namely Google Classroom. There are also many users of this platform because the platform is free and very easy to use. The features are not as complete as other LMS features, but can be completed by adding features that are also made by Google such as Google Meet, Google Form and Google Drive. The disadvantage of google classrom is that it does not have a private chat feature. There is only a discussion forum so if we want to reprimand students privately then we have to use another application.

These shortcomings can be complemented with an LMS such as moodle. Moodle is an online learning platform that is easily customized according to the user's wishes (amsraidorj & Sambuu, 2013; Soesanto et al., 2022). It has many plugins that allow adding certain features needed. In contrast to all the LMS mentioned above, all these platforms are available in a ready-made form so it is not possible to modify them. If the school has a wordpress-based website then the LMS created using moodle can be directly integrated.

Some features on the LMS that are considered important such as the assignment, feedback and quiz features are all on (Lakin, 2018) moodle. In addition, supporting features in lectures such as the integration of learning videos, the availability of discussion forums, private chats and content delivery are also very supportive in this LMS (Herayanti et al., 2018).

In this research we want to use moodle in developing the LMS. Moodle was chosen because it is already very popular in use. Although it is popular out there, students in Kolaka city, especially USN Kolaka students, are mostly unfamiliar with this LMS. In addition, moodle is very easy to use both using a laptop and using a smartphone. No less important is that moodle is effectively used for distance learning management (Pratiwi, 2022).

2. METHOD

This research falls into the type of development research (R&D). The development model used is the Plompt model. This model consists of four stages, namely initial investigation, design stage, realization, (test, evaluation and revision), and implementation stage. At the initial investigation stage, we will find out which mathematics courses are also taught in most study programs. This course will first be incorporated into the LMS system to serve as a trial course. In addition, we will find out the scope of material taught in each study program so that later it can be adjusted. The second is the design stage. In the design stage, the procedure for delivering lectures is designed. Lecture teaching materials can be in the form of video tutorials or video explanations of material. The process of delivering material using video is also designed in such a way as to be more interesting than classroom delivery. In addition, in this stage the LMS display is designed, the LMS plan to be used is Moodle. The third stage realizes the results of the design/design. This realization is the realization of making an LMS with complete material in it. After everything is complete, a

small group trial is carried out and then evaluated. There may be some shortcomings that need to be corrected. The fourth stage is the stage of implementing lectures using the LMS.

The research instrument used is a learning media validation instrument developed based on the Learning Object Review Instrument (LORI). There is no need for material validation because the material is taught by lecturers who have experience in their fields. For media validators taken from lecturers who are experienced in the field of learning media and lecturers from Information Systems who understand the website. The measurement scale in this instrument uses a semantic difference scale. The results obtained were then analyzed using the average score of the validators whose numbers were consulted with the classification table (Eko Putro Widyoko, 2012)

3. RESULTS AND DISCUSSION

3.1. Initial Investigation

In the odd semester of the 2022/2023 academic year, there was one student of the USN Kolaka Mathematics Education study program who participated in MBKM activities. The student took courses at IKIP Budi Utomo Malang. Due to differences in the curriculum at USN Kolaka, there are several compulsory courses at USN Kolaka that cannot be programmed at IKIP Budi Utomo. While these courses also cannot be converted from several courses taken at IKIP. Therefore, these students must take compulsory courses at USN Kolaka using the LMS.

Until now, the LMS of Universitas Sembilanbelas November Kolaka does not exist. Lecturers who provide distance learning facilities use free LMS such as google classroom. Not bad, but as an educational institution it should have independent supporting facilities to improve the quality of education.

Based on the results of interviews with the head of the mathematics education study program, information was obtained that the LMS is really needed to support the learning process. LMS is needed as a place to store teaching materials for lecturers. Teaching materials that are already available on the LMS will be easily accessed by students so that the transfer of teaching materials becomes more efficient. Currently, many lecturers have activities outside the campus such as being assessors in schools, ppg assessors and others. Therefore, LMS is needed for lecturers who do not have time to carry out offline lectures on campus.

3.2 Design Stages

The design stage started with thinking about the webhosting that would be used to install Moodle. It was also thinking of an appropriate name for the LMS. Actually, this LMS should be under the faculty or study program website. While the website of the Faculty of Teacher Training and Education is currently not active. To activate the faculty website affiliated with the university website, it must be communicated with UPT TIK. Moreover, if you want to install a certain LMS, everything must be under the control of UPT TIK.

This research is limited by time so that to streamline time, it is designed to make a stand-alone faculty website with the name <https://fkipusn.ac.id>. This web plan is made to facilitate control in making LMS. In order for the research to run smoothly, the making of the LMS must be fully controlled by the researcher. After the faculty website is finished, then think about the name of the LMS that will be used. Because USN Kolaka is located in the land of Mekongga, the term SIKONGGA (Online Lecture Information System for the Generation of Reliable Teachers) was taken as the name of the LMS. The Moodle LMS will be installed at <https://sikongga.fkipusn.ac.id>.

The course that will be included as an example is the numerical methods course. The teaching material plan used is a module made by the lecturer, video explanation of the material, exercises and assignments.

3.3 Realisation, (test, evaluation dan revision)

As planned, the Faculty website was finally created. From the website, a subdomain was created with the name <https://sikongga.fkipusn.ac.id>. It is on this subdomain that the Moodle LMS is installed. The display on the login page can be seen in Figure 1.



Figure 1. SIKONGGA Login Page

After the LMS is installed, some initial settings are made such as inserting the absence plugin and setting the mobile version. This needs to be done because by default the latest version of Moodle does not have an attendance feature and the mobile feature is also not active. After these settings are completed, it is continued by entering the names of students who will be used as test subjects into the LMS. Next, a course was created, namely the numerical methods course. After the course is created, students who have registered in the LMS are re-entered into the course/courses that have been created. After that, the material is entered along with the required exercise questions.

After all was completed, a trial was conducted on 3 students. The trial of using the LMS on mobile phones was carried out because all students have mobile devices. In the implementation of this trial there are only two things that need to be revised, namely: No notification appears on the student's cellphone when the lecturer sends a message. The assignment upload feature does not appear when given an assignment.

For message notification settings, it must be set again in the mobile version through the use account, preferences, messages icon and activate notifications in the mobile version as shown in the figure.

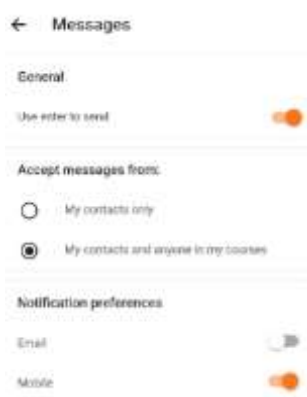


Figure 2. Message notification settings on mobile phones

After activating the feature, a notification will appear on the cellphone if a message is sent or entered. Next is the task upload feature. This feature may not be active if the submission permission in the assignment section is activated. Actually this feature is very well used to limit the time of sending assignments. However, if the time on the lecturer's device and the time on the student's device are different, this could be a problem. Especially if the time zone setting on the moodle device which by default is the United States has not been changed, it is likely to cause problems. To prevent this, this feature should not be enabled.



Figure 3. Task submission settings

Furthermore, testing and checking the function of all LMS supporting features such as the Attendance feature, delivery of teaching materials, quizzes / exercises and assessment features. All these features can function properly during the trial process so that after all the sides that are considered problematic are revised, proceed to the implementation stage.

3.4 Implementation stage

3.4.1 Attendance Feature

One of the features in the LMS that must be available is attendance. In moodle version 4.2.2, attendance is not installed by default. To activate this feature, you need to download the attendance plugin at <https://moodle.org/plugins/>. Once installed, the new attendance feature can be used. Lecture attendance can be done manually by lecturers for each course schedule. However, students can also do their own attendance only during lecture hours. Outside of those hours, students cannot take attendance.

Absences in Moodle can be exported into an excel file to see a recap of student attendance. In addition, the export results can actually also be used for administrative reports if needed. The results of the attendance recap in moodle display the number of attendances, permits, absent or late including attendance presentations. An example of an absence recap can be seen in the picture.

Course Group		Metode Numerik												
All participants														
No	Name	12 Sep 2023	19 Sep 2023	26 Sep 2023	3 Oct 2023	10 Oct 2023	17 Oct 2023	P	L	E	A	Taken sessions	Points	Percentage
1	arjunal arjunal	User enro ←	←	←	P (2/2)	P (2/2)	P (2/2)	3	0	0	0	3	6 / 6	100
2	rosalia dalima rao	User enro ←	←	P (2/2)	P (2/2)	A (0/2)	P (2/2)	3	0	0	1	4	6 / 8	75
3	NUR DAWIA	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	6	0	0	0	6	12 / 12	100
4	NUR FAJRIANI	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	6	0	0	0	6	12 / 12	100
5	finalia	User enro ←	←	P (2/2)	P (2/2)	A (0/2)	P (2/2)	3	0	0	1	4	6 / 8	75
6	FAJRUN NISA	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	6	0	0	0	6	12 / 12	100
7	ANDI DWI NURAFNI	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	6	0	0	0	6	12 / 12	100
8	WINDI SAPUTRI ODE	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	6	0	0	0	6	12 / 12	100
9	AI SYAH DYAH AYU PRAVITASARI	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	P (2/2)	6	0	0	0	6	12 / 12	100

Figure 4. Printout of attendance list to excel spreadsheet

3.4.2 Teaching Material Delivery Features

Teaching materials are provided in the form of modules and videos. The module is a pdf file that has been uploaded to the drive. To enter teaching materials into moodle, you can use the link from the file. Both modules and pdfs are very easy for students to access. Apart from that, moodle also provides a "book" feature that can be used to create online books in the system. This facility allows students to read books online, including printing books both as a whole and by chapter.

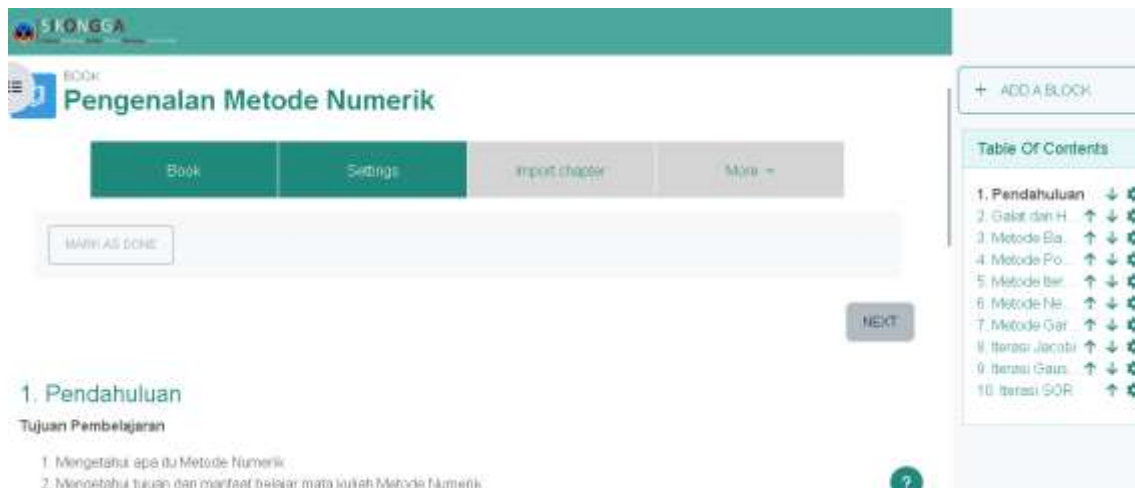


Figure 5. Book features in Moodle

3.4.3 Quiz Feature

In the latest moodle version 4.2.2 there are many quiz options that can be used to create questions. These options include: Multiple Choice, True/False, Matching, Short Answer, Numerical, Essay, Calculated, Calculated Multichoice, Calculated, Simple, Drag and Drop Intro Text, Drag and Drop Markers, Drag and Drop onto image, Embedded answer, Random Short-Answer Matching, Select Missing Words. In addition, there is also an "Assignment" feature that can be used to give assignments to students. This feature can be used to provide assignments that can be uploaded to the system. The settings are also flexible so that it can accept various kinds of files, including in this case text.

In this research, the quiz types used are Multiple Choice one answer choice, multiple choice more than one answer choice, true/false and numerical. The use of all these quiz types did not experience any problems. Everything worked as it should.

For the assignment feature, students are asked to send files to the system. They can send in the form of pdf files or in the form of images. However, sending files like this will eventually make the storage capacity full. In the implementation of research, files sent to the system, both pdf and images, cannot be checked directly on a laptop or cellphone. To check student assignments that have been deposited, they must be downloaded first. Most likely Moodle version 4.2.2 is not supported by pdf and jpg readers. But it is also possible that the pdf and jpg reader feature has not been activated, this has not been identified. To get around this, students can upload their work using the link feature. The assignment file is uploaded to each student's drive. They just send the link of the file to be checked. Through this method, the assignment file can be checked immediately without having to download the file. In

addition to making it easier to check, it also does not burden the system due to the reduction of storage.

3.4.4 Assessment Features

The assessment feature in Moodle works very well. The categories to be assessed can be determined by yourself including the presentation grade. Not only that, the setting of letter grades can also be set in the moodle assessment. Moodle provides letter grading but lecturers can change the grading system according to what is applicable on campus.



a. Arrangement of assessed aspects

b. Font Grade Setting

Figure 6. The assessment feature can set the aspects that are assessed and also the letter description can be adjusted.

3.4.5 Communication Features

Moodle has a mobile version on android. With this mobile version, moodle can be used to communicate like other communication tools such as WhatsApp. It's just that its capabilities are not as capable as the WhatsApp application. But if only to be used for sending text messages, then the communication features in moodle are sufficient. With the mobile version of moodle, lecturers can send messages to students and vice versa. If someone sends a message, then on the recipient's cellphone there will be a notification like in the WhatsApp application. However, the shortcomings in this communication feature cannot include attachments such as files, images or others.

4. CONCLUSION

The features of moodle are unquestionable in the distance learning process. The online learning platform using moodle produced in this research fulfills all the criteria of a complete LMS. All features function well and are easy to use. There is a learning flow feature in moodle that might be used to organize the course of lectures. This feature was not used in this research. It will be studied in the next research topic.

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