Data Mining Approach for Learning management system

Harry Dhika¹, Fitriana Destiawati², Surajiyo³, Musa Jaya⁴

¹²³⁴Department of Engineering and Computer Science, Indraprasta PGRI University Jakarta, Indonesia

*dhikatr@yahoo.com

Abstract. During the pandemic, COVID-19 had an impact on education. All academic activities are hampered, teaching and learning activities must continue to run, and the efforts made are to do distance learning or e-learning. This relates to the integration of systems that must be synchronized with computers, mobile, and technology that can manage learning media electronically. In this study, the LMS in the COVID-19 pandemic period aims to optimize a learning system and provide convenience in the use of technology to deal with this pandemic. The results of this study are explaining the testing of the COVID-19 dataset with the concept of data mining and providing convenience in the application of Moodle-based e-learning so that the development of LMS can be maximized.

1. Introduction

In the development of increasingly modern technology, it provides facilities in all the activities carried out. The new method of learning activities certainly relates to the place or process of teaching and learning for students and teachers. During the COVID-19 pandemic, the learning activities could not be carried out as usual because academic activities in schools could lead to wider dissemination, the application of large-scale social restrictions required learning activities to be carried out at home, this transition could not be avoided by anyone so readiness was needed to adjust to the pandemic period of COVID-19. Ease of learning activities at home can use e-learning in its implementation. Ease of using technology as a support for learning activities, especially for teachers who can take advantage of technology, students also get convenience for learning activities at home in the application of electronic learning or e-learning. Networks and computers become important components in the use of Learning Management Systems, learning processes, and communication more efficiently using e-learning that can be used as a source of learning activities, as a means of delivering teaching materials, evaluations, and assessments by teachers for students concerned.

Several kinds of factors that make the learning system said to be ineffective are the learning models, so learning media is needed. Learning media is basically a tool or method used to deliver teaching materials, various learning media can use various methods or methods so that the learning process can take place effectively. With the LMS software, it can increase students’ interest in learning activities, especially at home. The LMS that we increasingly rely on as a means of learning has considerable potential in knowledge building and competency development [1]. E-learning is a learning medium that is devoted to educational institutions, which aims to support electronic learning such as Moodle. The use of Moodle-based e-learning as a medium for managing learning activities is linked to planning,
implementing, and evaluating activities. In this context, Moodle formed a concept as electronic learning which is a new learning framework that is more effective in completing collaborative activities and making information together between teachers and students. This new framework is expected to adapt to the COVID-19 pandemic where everything related to technology and information is carried out remotely.

The use of LMS can have a positive impact, especially in terms of time and place. E-learning has developed rapidly with various technologies and devices to access learning resources, such as laptops, computers, smartphones, and tablets. Technology has greatly influenced education and learning and teaching methods. [2]. Teachers and students can share information about learning directly without having to be in the same place, not even bound by time. This is what makes the role of technology that can have a good impact on education. Technology and education are the things that most influence the system in the progress of a nation and state. The effectiveness and efficiency, as well as the attraction, offered greatly impact the education field, students can increase their interest in learning by following the development of increasingly modern times in different ways. Therefore, this discussion of electronic learning as a material consideration in the development of Moodle-based e-learning that can be used in every school in Indonesia.

2. Methodology
Processing data using software R. With the concept of data mining that is looking at data extraction and finding new data patterns that will be interpreted so as to provide specific patterns that can be used and utilized for the benefit of the development of COVID-19. The writing method used in the form of collecting materials in the form of theory taken from the results of the analysis obtained in the application of distance learning or e-learning that is applied by high school teachers in Jawa-Bali, the object of this study is the teacher and students.

3. Result and Discussion
ICT provides a technological solution to this practical difficulty [3]. E-learning content providers must attract students with appropriate e-learning content and they must incorporate e-learning services and technology adequately into the e-learning process [4]. A very important e-learning tool is the Learning Management System. LMS is an application that provides facilities in making the learning media process directly as software for delivering learning, administration, reporting, and documentation programs. Features in the LMS are management of user access rights, management of learning courses, management of learning materials, management of activities, management of grades, displaying transcript of values, and management of displays.

In LMS, mediation involves the acquisition of competencies and communication skills of all teachers and students, and a greater concern for creating moments of interaction and possible practical applications of collaborative work, that with the learning process occurring in a participatory manner. [5]. The LMS that we increasingly rely on as a means of learning has considerable potential in knowledge building and competency development. Thanks to the various services offered by this e-learning platform, individuals can interactively access and use various sources of information available to them anywhere, anytime. They can also tailor training programs and thus develop their abilities to the highest potential level according to their needs [1]. The advantages of e-learning as opposed to traditional learning are immediately evident with e-learning making education independent of time and location. More importantly, it opens up new possibilities for implementing pedagogical innovation in an environment where students are expected to function as active, independent, and collaborative participants [6].

The COVID-19 pandemic requires schools to apply a learning method based on technology, communication, and information, so that distance learning is created to reduce the impact of dissemination. This must be done because based on the Sars Coronavirus Accession dataset from Kaggle, the new dataset explains COVID-19 has spread very widely. The test was carried out from 17
records contained in the dataset and only 3 columns had interesting attributes for the mining association rule task namely Collection Date, Geo-Location, and Isolation Source.

![Dataset Sars Coronavirus Accession from Kaggle](image)

**Figure 1.** Dataset Sars Coronavirus Accession from Kaggle

The data set obtained from Kaggle attributes for data mining processing with permission to date the data, the location of the data obtained, and the source of isolation to cope with the significant transmission.

![Data Collection Date](image)

**Figure 2.** Data Collection Date

The date of data collection is in the form of a diagram showing the significance level of the spread of COVID-19 over time, with the calculation of data collection, data mining can be processed to find out the possibilities that exist.

![Data Geo Location Cluster](image)

**Figure 3.** Data Geo Location Cluster

Geographical location in the spread of COVID-19 into clusters in prevention efforts, with known calculations with a significant degree of spread. This attribute will be adjusted to data mining processing to determine the pattern or rule that will be produced.
The calculation of the source of isolation in the spread of COVID-19 has the attributes and data in the calculation that will be used in data mining, with the processing concept, the following rules are generated:

```
>inspect(rules)
```

| Lhs                          | rhs                  | support    | confidence | lift     | count    |
|------------------------------|----------------------|------------|------------|----------|----------|
| Collection_Date=1/22/2020    | Geo_Location=USA     | 0.04310345 | 3.314286   | 0.04310345 | 20       |
| Collection_Date=2019-12      | Geo_Location=China   | 0.08189655 | 2.241546   | 0.08189655 | 38       |
| Collection_Date=1/29/2020    | Geo_Location=USA     | 0.08620690 | 2.549451   | 0.08620690 | 40       |
| Collection_Date=12/30/2019   | Geo_Location=China   | 0.17241379 | 2.241546   | 0.17241379 | 80       |
| Isolation_Source=lung        | Geo_Location=China   | 0.21551724 | 2.241546   | 0.21551724 | 100      |
| Isolation_Source=oronasopharynx | Geo_Location=USA   | 0.23706897 | 2.680672   | 0.23706897 | 110      |
| Collection_Date=1/25/2020,Isolation_Source=oronasopharynx | Geo_Location=USA | 0.04310345 | 3.314286   | 0.04310345 | 20       |
| Collection_Date=1/29/2020,Isolation_Source=oronasopharynx | Geo_Location=USA | 0.08620690 | 2.549451   | 0.08620690 | 40       |
| Collection_Date=12/30/2019,Isolation_Source=lung | Geo_Location=USA | 0.17241379 | 2.241546   | 0.17241379 | 80       |

The smallest support value is 0.04310345 and the smallest confidence value is 0.8088235
With values that have been entered and processed in a rule, it produces a pattern where this graph is a source of isolation from the 9 rules that have been entered and produces a decision tree pattern.

The visual image generated from the decision tree with the resulting rules contains data and attributes that have been managed with the data mining concept. This allows for creation. This allows for the creation of group matrices with additional rules.
From the attributes and data that have been managed with data mining, it produces 9 rules with a group matrix of 10 rules with an accurate data processing level to find out and explain the pattern that COVID-19 is still developing and increasing every day.

Tests have been carried out based on Collection Date, Geo-Location, and Isolation Source. Explaining that COVID-19 is still developing and its spread is still increasing every day, the application of LMS has become an important role in dealing with the COVID-19 pandemic.

Basically, e-learning is a learning process that focuses on students and teachers interacting directly with each other, both must be connected to the internet network and access e-learning to each other together. The advantages of e-learning can save time and facilitate the process of delivering material, not tied to a place because it can be done anywhere, reaching a wide place and area, training students to learn more independently to gain knowledge because information can be easily accessed via the internet. E-learning system is a system that provides the necessary services to handle all aspects of the course through a single, intuitive, and consistent web interface. These services, for example: course content management, synchronous and asynchronous communication, return of student work, uploading of content, student administration, peer assessment, online quizzes, online questionnaires, tracking devices, collection and setting student scores, etc [4].

Learning needs to use technology, methods in e-learning must be by what students need. Thus the suitability of the merging method is very important to be taken into account. Moodle is an LMS that can be used in the application of e-learning. Advances in information and communication technologies offer new opportunities [7] this analysis starts with the most powerful and commonly used tools for synchronous distance e-learning [8]. Moodle is the name for a free web-based application program for educators that can transform learning media into web media, one of the most popular open-source LMS.

Moodle is an open-source LMS, collects a large amount of data about student interactions within it, including content, assessment, and communication. Some of this data can be used as proxy indicators of student engagement, as well as predictors for performance [9]. Moodle is used for teaching and learning in education. Students and teachers can connect to exchange their ideas, information, questions, and answers. Responding to their questions and discussions, the material and information needed was published in Moodle-based e-learning learning media. This helps them better understand and study learning material through the web that can be easily accessed through their respective computers without being bound by place and time, and especially students prefer a face-to-face approach but supported by online Moodle activities as a learning method different. Teaching and online learning can be useful for students and teachers, who work well for educational purposes in terms of curriculum. There is an increase in education about traditional and online learning, with a high concern for the growth of information technology and the use of e-learning. Face-to-face learning in groups with the support of e-learning in bridging the gap between students and teachers. E-learning has proven that usability, effectiveness, and convenience are key factors for acceptance in its use. Thus the implementation of information and communication technology in education with e-learning through Moodle enables increased educational effectiveness.

Learning media can be said to be a tool to convey messages so that they can reduce verbalism and the learning process can take place effectively. Learning media are tools, methods, and techniques used to streamline communication and interaction between teachers and students in the learning process. [10]. Moodle is a program that can develop learning media into a form of web media that is directly connected to the network that provides easy access for its users. The e-learning program allows students to access digital classes to obtain learning materials. By using Moodle, making learning materials easier, quizzes for evaluation of learning, and others. The use of LMS has an impact on teacher and student interactions. All content is captured in a computerized database making it easier to process and retrieve data that can be used for learning purposes. The analytical field of learning is relatively easy and the fields that are closely related to the development of educational data to better understand and optimize student learning.
The development of LMS will certainly have a good impact on the existing learning system in schools, this certainly provides great potential in the use of existing technology and communication. Learning is done differently, providing high interest in learning, especially for students. Students can access and use it interactively various sources of information available on the internet to support learning in schools that implement electronic learning. Moodle has features as supporting electronic learning, namely: news and announcements, learning material, evaluation material or quizzes, student grades, and online academic calendars that contain the agenda of event activities that have been made.

**Figure 8.** News and Announcements for LMS Moodle

**Figure 9.** Learning Material for LMS Moodle

**Figure 10.** Quiz LMS Moodle
4. Conclusion
The COVID-19 pandemic period requires schools to apply a learning method based on technology, communication, and information, so that distance learning can be created to reduce the impact of the spread of COVID-19. LMS can implement electronic learning or called e-learning, by creating an effective learning system during the COVID-19 pandemic. Moodle is an LMS that can be used to enhance distance learning activities to create and create learning conditions for students and make it easy for teachers to provide knowledge and teaching to be better, and more perfect in the pandemic of COVID-19.

References
[1] M. Ouadoud, M. Y. Chkouri, and A. Nejjari, “Learning Management System and the Underlying Learning Theories: Towards a new Modeling of an LMS,” Int. J. Inf. Sci. Technol. - iJIST, vol. 2, no. 1, pp. 25–33, 2018.
[2] D. Al-Fraihat, M. Joy, R. Masa’deh, and J. Sinclair, “Evaluating E-learning systems success: An empirical study,” Comput. Human Behav., vol. 102, no. March 2019, pp. 67–86, 2020.
[3] R. Shah, S. Chakrabarti, A. Sharma, S. Grover, D. Sachdeva, and A. Avasthi, “Participating from homes and offices: Proof-of-concept study of multi-point videoconferencing to deliver group parent training intervention for attention-deficit/ hyperactivity disorder,” Asian J. Psychiatr., vol. 41, no. February, pp. 20–22, 2019.
[4] B. Šumak, M. Heričko, M. Pušnik, and G. Polančič, “Factors affecting acceptance and use of moodle: An empirical study based on TAM,” Inform., vol. 35, no. 1, pp. 91–100, 2011.
[5] P. C. de Oliveira, C. J. C. de A. Cunha, and M. K. Nakayama, “Learning Management Systems (LMS) and e-learning management: an integrative review and research agenda,” J. Inf. Syst. Technol. Manag., vol. 13, no. 2, pp. 157–180, 2016.
[6] G. Kakasevski, M. Mihajlov, S. Arsenovski, and S. Chungurski, “Evaluating usability in learning management system moodle,” Proc. Int. Conf. Inf. Technol. Interfaces, ITI, no. May 2014, pp. 613–618, 2008.
[7] M. M. Archibald, R. C. Ambagtsheer, M. G. Casey, and M. Lawless, “Using Zoom Videoconferencing for Qualitative Data Collection: Perceptions and Experiences of Researchers and Participants,” Int. J. Qual. Methods, vol. 18, pp. 1–8, 2019.
[8] D. F. García, C. Uria, J. C. Granda, F. Suárez, and F. González, “A Functional Evaluation of the Commercial Platforms and Tools for Synchronous Distance e-Learning,” Proc. 3rd WSEAS/IASME Int. Conf. Educ. Technol. (EDUTE 2007), pp. 330–335, 2007.
[9] D. Yen, -Ting Liu, J.-C. Froissard, D. Richards, and A. Atif, “An enhanced learning analytics plugin for Moodle: student engagement and personalised intervention,” Glob. Connect. Digit. enabled. Proc. ascilite 2015, pp. 180–189, 2015.
[10] S. Setiyorini, S. Patonah, and N. A. N. Murniati, “Pengembangan Media Pembelajaran Moodle,” J. Penelit. Pembelajaran Fis., vol. 7, no. 2, pp. 156–160, 2017.