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LMS Implementation in High Schools in Eastern Indonesia After the Covid-19 Pandemic

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ABSTRAK

Pandemi Covid-19 telah menghalangi siswa dan guru untuk melakukan kegiatan belajar mengajar di kelas fisik karena adanya pembatasan aktivitas, penjarakan sosial, atau lockdown. Permasalahan yang terjadi adalah belum tersedianya sistem pengelolaan pembelajaran berbasis IT (online) di banyak sekolah sehingga menyebabkan proses belajar mengajar dari luar sekolah menjadi tertunda. Covid-19 tidak hanya menyebabkan darurat kesehatan, namun juga darurat pendidikan. Penelitian ini bertujuan untuk mengembangkan LMS dan mengimplementasikannya secara gratis di beberapa sekolah di wilayah timur Indonesia dan menganalisis dampak penerapannya selama 2 tahun. Metode penelitian yang digunakan adalah Metode Prototype dengan tahapan Communication, Modeling, Construction, dan Deployment. Pada tahap komunikasi, pengumpulan data dilakukan melalui wawancara dengan beberapa pihak sekolah mengenai kebutuhan sistem. Pada tahap Pemodelan dilakukan perancangan sistem dengan menggunakan class diagram, use case diagram, activity diagram, dan sequence diagram. Pada tahap konstruksi dilakukan pengembangan aplikasi dengan menggunakan bahasa pemrograman web PHP dengan database MySQL. Pada tahap deployment, implementasi dilakukan pada platform Microsoft Azure Cloud. Hasil penelitian menunjukkan bahwa penerapan LMS memberikan peningkatan skor pada bidang eksakta (Matematika) dan bidang ilmu bahasa (Bahasa Inggris). Sedangkan untuk bidang ilmu-ilmu sosial (Kewarganegaraan) tidak menunjukkan peningkatan yang signifikan.

ABSTRACT

The Covid-19 pandemic had prevented students and teachers from carrying out teaching and learning activities in physical classroom due to activity restrictions, social distancing, or lockdown. The problem that occurs is the unavailability of an IT-based (online) learning management system in many schools causing the teaching and learning process from outside the school to be delayed. Covid-19 has not only caused a health emergency, but also an educational emergency. This research aimed to develop an LMS and implement it free of charge in several schools in eastern Indonesia and analysed the impact of implementation over 2 years. The research method used is the Prototype Method with the stages of Communication, Modeling, Construction, and Deployment. At the Communication stage, data collection was carried out through interviews with several school parties regarding system requirements. At the Modeling stage, system design is carried out using Class Diagram, Use Case Diagram, Activity Diagram, and Sequence Diagram. At the Construction stage, application development is carried out using the PHP web programming language with a MySQL database. In the Deployment stage, implementation is carried out on the Microsoft Azure Cloud platform. The results of the research shown that the implementation of the LMS provided an increase in score for the exact sciences (Mathematics) and the language sciences (English) fields. As for the field of social sciences (Citizenship) did not show a significant increase.

1. INTRODUCTION

School is a building or educational institution that functions as a place for teachers to provide supervision and teaching to students. Activities in school include teaching and learning as well as other activities that support this process. In teaching and learning activities, there are main elements, namely student, teacher, and material (Mumtahan & Pamungkas, 2022; Yulianto, Khosasih, et al., 2021; Yulianto, Prajena, et al., 2021). In addition, to support the teaching and learning process, it is necessary to provide both physical and non-physical facilities. Physical facilities in the form of classroom, laboratory, and equipment. Non-physical means such as digital content, the internet, and learning management systems (LMS) (Noortyani et al., 2021; Prestiadi et al., 2021). Most schools in eastern Indonesia still use teaching and learning method in the classroom only. In addition, the process of collecting, processing, and managing data is also still done manually so it is inefficient and not stored digitally (Arifin et al., 2021; Mendoza et al., 2021; Sarosa & Setyowati, 2022). This is due to 2 things, namely the lack of availability of human resources who can provide IT-based systems for schools, and the lack of funds for the

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development of the systems. The Covid-19 pandemic has forced the digitalization process of various business sectors to accelerate, including educational institutions such as schools (Dias et al., 2020; Salman et al., 2022). Students and teachers cannot carry out teaching and learning activities in physical classroom due to activity restrictions, social distancing, or lockdown (Abdullah et al., 2020; Mohammadi et al., 2021; Sanoto et al., 2023). On the other hand, the unavailability of online IT-based systems causes the teaching and learning process in schools to be delayed. Covid-19 has not only caused a health emergency, but also an educational emergency.

Research conducted by previous study stated that prior to the spread of Covid-19, LMS had been used, although not much, by educational institutions as a facility to support the educational process (Zharova et al., 2020). The Covid-19 pandemic caused a mass shift from onsite to online learning resulting in an increase in demand for LMS use. But the real problem faced by schools is the lack of human resources that are competent in the field of IT, the speed of technology adoption by both lecturers and students, ready-to-use digital materials, and internet infrastructure in the regions (Barona & Ramirez, 2021; Dharma & Siregar, 2015). Research conducted by previous study stated that LMS helped online learning well during the Covid-19 Pandemic (Putri et al., 2021). The study is state Google Classroom technology with a research area in central Indonesia. Similar studies have also been conducted by other study in western Indonesia (Chanifah et al., 2021; Noortyani et al., 2021), other study in eastern Indonesia (Arifin et al., 2021), there is also in Vietnam (Khoa et al., 2021), and in state Croatia (Baksa et al., 2021), previous study in India (Singh et al., 2021), and provide the same conclusion that LMS provides increased value to learning.

Previous studies had not explicitly examined how much contribution the use of LMS after the Covid-19 pandemic to the increment of subject scores. As a solution to this problem, the purpose of this study was to develop an LMS from June 2020 to February 2021 and implemented it for free in several schools in eastern Indonesia in the new school year July 2021. The novelty of this study is the result of implementation impact that is analysed over 2 years (2022-2023) on subjects categorized into three sciences namely numerical, language, and social. This study shown that the implementation of LMS has caused an increase in the average score of students in certain fields of science and made the learning process more interesting, easy and efficient. Apart from that, LMS can also support learning activities in schools that don't already have, especially after the Covid-19 pandemic. The development process and the results of the analysis are presented throughout this article.

2. METHOD

The system development method used in this study is the Prototype Method. In the Prototype Method, system development is carried out in a structured manner through several stages. If the system development is not in accordance with the requirements, then the system will be evaluated and repaired repeatedly. The Prototype Method allows for interaction between programmers and users so that they can overcome discrepancies between them (Pressman & Maxim, 2020). The stages in the Prototype Method include Communication, Modeling, Construction, and Deployment as show Figure 1. At the Communication stage, data collection was carried out through interviews with several school parties regarding system requirements. At the Modeling stage, system design is carried out using Class Diagram, Use Case Diagram, Activity Diagram, and Sequence Diagram. At the Construction stage, application development is carried out using the PHP web programming language with a MySQL database (Pressman & Maxim, 2020). In the Deployment stage, implementation is carried out on the Microsoft Azure Cloud platform. Prototype method is show in Figure 1.

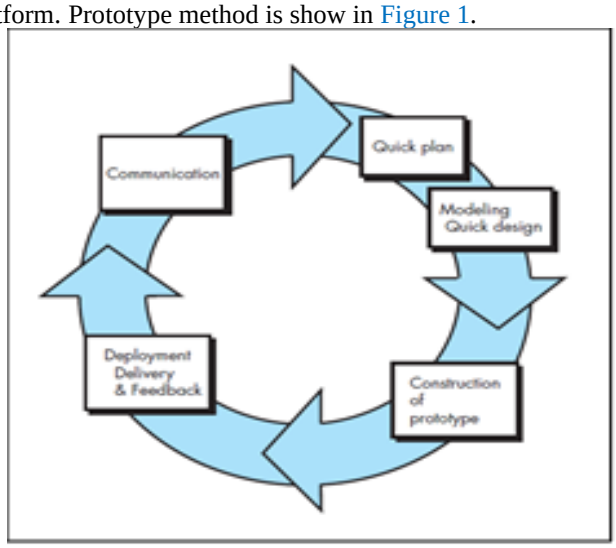

Figure 1. Prototype Method

Interviews are conducted at 3 private high schools in eastern Indonesia. The people that are interviewed are the principal or vice principal of the school. The results of the interviews for collecting data on needs are that (1) several schools already have official websites and only served as promotional media to the community, (2) schools do not yet have an LMS to support the teaching and learning process outside the classroom, (3) learning is still carried out in classroom only, (4) assignments are done by students in notebooks and collected by the teacher, (5) the majority of discussions or questions and answers only occur in the classroom so that students cannot ask questions to the teacher after the class session because there is no communication channel (the majority of teachers do not provide contact numbers), (6) outside of class sessions, students only study based on textbooks or notes, (7) students already have a PC computer that is connected to the internet at home (possibly belonging to their family members), and (8) students already have mobile device. The instrument used in this research is interview and the instruments grids is described in Table 1.

Table 1. The Instrument Grids of Interview

Indicators	Sub-Indicators	# Questions
IT-based Support	School ownership of IT-based system such as official website or learning management systems	2
Learning	The teaching-learning process of students and teachers in schools	3
Activities	Student learning process outside the classroom	3
Technology	Administrative feature requirements	4
Requirement	Feature requirements for teaching and learning activities	5

The LMS feature requirements that are developed based on the interview results are (1) LMS is prioritized using Indonesian (because the majority of students and teachers are not accustomed to English), (2) authentication (login and logout), (3) view profiles, (4) announcements, (5) providing administrative features (such as recording attendance), (6) viewing schedules, (7) accessing additional materials, (8) accessing questions and submitting assignment answers, and (9) viewing grades. Schools don't want the discussion forum feature yet to avoid increasing the teacher's workload. This feature has been suspended after evaluating the LMS usage process.

3. RESULT AND DISCUSSION

Result

The analysis was carried out from the test scores or competencies of 3 high school subjects, namely Mathematics which represented the exact or numerical sciences, English which represented language sciences, and Citizenship (Pancasila) which represented social sciences. The limitations of this study are that the research object is still being carried out in several schools in eastern Indonesia and has not been carried out extensively in other regions. The subjects analysed were only limited to 3 subjects. The participants analysed was only Senior High School grade 1-3 students. It is recommended that further study expand the research object to other regions, conducted at primary and secondary school levels, and to more diverse subjects. Demographics are shown in Table 2. Intake Year is the year students enter school and Graduate Year is the year students graduate in Grades 1-3.

Table 2. Student Demography by Intake and Graduate Year

Intake Year	Graduate Year				
	2019	2020	2021	2022	2023
Intake 2016	Grade 3				
Intake 2017	Grade 2	Grade 3			
Intake 2018	Grade 1	Grade 2	Grade 3		
Intake 2019		Grade 1	Grade 2	Grade 3	
Intake 2020			Grade 1	Grade 2	Grade 3
Intake 2021				Grade 1	Grade 2
Intake 2022					Grade 1

Table 2 shows the average of national or competency exam score of Mathematics from 2019-2023. In 2019, the exam was held onsite (before the Covid-19 pandemic). In 2020, the government abolished the national exam as a follow-up to the Covid-19 pandemic to anticipate the spread of Covid-19. In 2021, competency exams were conducted online or hybrid. In 2022-2023, competency exams were conducted onsite again with due observance of health protocols. The average scores for English and Citizenship (Pancasila) are shown in Table 3, Table 4, and Table 5.

Table 3. Average Score of Mathematics Subject

Intake Year	Average Score of Mathematics Subject				
	2019	2020	2021	2022	2023
Intake 2016	72				
Intake 2017	74	-			
Intake 2018	71	-	72		
Intake 2019		-	73	76	
Intake 2020			70	78	76
Intake 2021				76	77
Intake 2022					79

Table 4. Average Score of English Subject

Intake Year	Average Score of English Subject				
	2019	2020	2021	2022	2023
Intake 2016	77				
Intake 2017	74	-			
Intake 2018	78	-	74		
Intake 2019		-	72	81	
Intake 2020			75	79	82
Intake 2021				82	81
Intake 2022					81

Table 5. Average Score Of Civics (Pancasila) Subject

Intake Year	Average Score of Civics Subject				
	2019	2020	2021	2022	2023
Intake 2016	79				
Intake 2017	77	-			
Intake 2018	83	-	83		
Intake 2019		-	82	80	
Intake 2020			78	80	81
Intake 2021				82	83
Intake 2022					82

Table 6 and Figure 2 show a summary of the average scores of the 3 subjects for the graduate year. The results of the analysis conclude that there is an increase in scores in 2022-2023 after the implementation of the LMS for the exact sciences (Mathematics) and language sciences (English).

Table 6. Summary Of Average Score Of 3 Subjects (2019-2023)

Intake Year	Average Score of 3 Subjects				
	2019	2020	2021	2022	2023
Mathematics	72.33	-	71.67	76.67	77.33
English	76.33	-	73.67	80.67	81.33
Civics	79.67	-	81.00	80.67	82.00

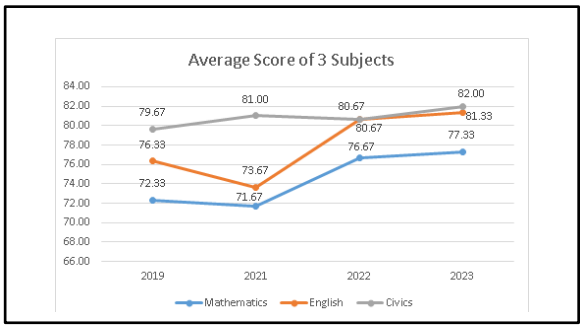

Figure 2. Summary of Average Score of 3 Subjects (2019-2023)

Base on Table 6 and Figure 2, The average increase in math scores is 5 points and the increase in English scores is 7 points. As for the field of social sciences (Citizenship) do not show a significant increase.

Discussion

In the experimental group that implemented LMS, there was an increase in the average mathematics score of 5 points. This shows that the implementation of the LMS makes a positive contribution to students' understanding and performance in mathematics subjects. The use of online platforms allows students to access additional study resources, interactive practice questions, and technology-based learning, potentially improving their exam results (Dias et al., 2020; Yulianto, Khosasih, et al., 2021). LMS implementation also had a positive impact on improving English scores, with an average increase of 7 points. The use of digital learning resources, multimedia content, and online interactions in English learning can motivate students to be more active and effective in understanding the material (Bosica et al., 2021; Jacob & Karn, 2003). These results reflect students' adaptability to technology-based learning methods. Although the implementation of the LMS succeeded in improving exam results in mathematics and English subjects, the results did not show a significant improvement in social science subjects (Citizenship) which attracted attention. This factor could be due to the lack of integration of civics material in the LMS platform or the qualitative nature of this subject which requires a more interactive and discursive learning approach. The significant improvement in mathematics and English scores can be attributed to easier access to learning resources, the possibility of online collaboration between students and teachers, and the application of adaptive and interactive learning methods. LMS platforms provide space for personalized learning and support students' individual learning needs (Heri Suryaman et al., 2020; Ibrahem & Alamro, 2020). The lack of significant improvement in civics subjects suggests that LMS implementation may not have fully integrated civics aspects into the curriculum or lacked implementation of learning methods that allow for deeper discussion, analysis and reflection on civics issues. Further development is needed in designing learning materials and teaching methods specifically for this subject.

This study is expected to have implications for supporting learning activities in schools that do not yet have an LMS, especially after the Covid-19 pandemic. This study shown that the implementation of LMS has caused an increase in the average score of students in certain fields of science (Mathematics and English). Further research can be conducted in the form of further LMS development with the addition of discussion forum feature (Aljahromi, 2020; Yunus et al., 2023), learning analytics (Aguilar & Brian Duche Perez, 2021; Asada et al., 2021; Yulianto et al., 2018), more diverse and interactive material formats (Rice, 2022; Sholeh et al., 2021; Yulianto et al., 2017), and video conferencing facilities (Camilleri & Camilleri, 2022). Implementation needs to be done in more schools and evaluation can be done in more other subject.

The results of this research provide a basis for further development in the implementation of LMS in high schools. Additional efforts are needed to improve the integration of civics material into the LMS platform and design learning methods that better suit the characteristics of the subject. In addition, it is recommended to identify and overcome potential barriers or obstacles that may arise in the LMS implementation process to maximize its benefits for all subjects.

4. CONCLUSION

This research has been conducted for 3 years consisting of the LMS development stage in 2020, implementation in 2021, and evaluation in 2022-2023. The results showed that the implementation of the LMS gives an increase in scores for the exact sciences (Mathematics) by 5 points and for the language sciences (English) by 7 points. As for the field of social sciences (Citizenship) do not show a significant increase. In addition, the application of LMS can also increase grades in several subjects and make the learning process more interesting, easy and efficient.

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