The effectiveness of Moodle among engineering education college students in Indonesia

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Article Info	ABSTRACT
	The selection of learning media in accordance with the subject will greatly affect the interest and response of students in attending learning. In addition, during the COVID-19 pandemic, learning is conducted online, many students are not serious and are not interested in attending learning. Therefore, it is necessary to have media or online lecture platforms that can attract students' attention, so that students can follow and be interested in learning. The purpose of this study was to look into the impact of Moodle on the research methodology performances of college students in Indonesia. Its goal was to investigate college students' reactions to Moodle as an innovative online platform. This study included 86 Indonesian college students who sat in a single intact group. Based on the quantitative data, the study used a quasi-experimental design and a one-group pretest-posttest design. A test and a questionnaire were used to collect data. According to the study's findings, Moodle improved Indonesian students' research methodology performance. Students were excited to use Moodle because of its simplicity, usefulness, and accessibility. Moodle's effectiveness in other contexts should be investigated in future research. This study confirmed Moodle's dependability in broader contexts.

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1. INTRODUCTION

Higher education students are becoming increasingly reliant on modern technologies for research and study, pushing academics and web designers to seize the opportunity and develop new technology. The majority of students want and are enthusiastic about new technology [1]. However, new technologies always result in changes in students' lifestyles. According to Manca and Ranieri [2], technology are less time consuming and are more concerned with time restrictions than educational opportunities. As a result, a web-based learning platform has come to be seen as a tool that may save time, demonstrate social abilities, demonstrate self-learning and self-disclosure, and urge people to stay current with new trends [3].

The outbreak of COVID-19 (Coronavirus disease) is increasingly spreading all over the world. This epidemic experienced a very fast transmission process, so that in a short time it was able to infect the world community [4], [5]. The latest World Health Organization (WHO) data shows that the number of confirmed positive patients in 216 countries is 295 million cases, of which 60.1 million people have recovered and 5.46 million people have died (Update: 07-01-2022). Indonesia is one of the countries that have been affected by a similar impact since the beginning of March 2020 until now. Data sourced from the Indonesian Task Force for the Acceleration of Handling COVID-19 shows the number of confirmed positive patients as many as

1.19 million people of which 993.000 patients were declared cured and 32.381 patients were declared dead spread across 34 provinces in Indonesia.

The rapid spread of COVID-19 has disrupted various sectors [6]. At first this outbreak had a severe impact on the economic sector, but now the impact is also being felt by the education sector. The policy carried out by various countries in the world including Indonesia is to eliminate all face-to-face learning activities [7]. This policy was carried out to minimize the spread of COVID-19 [8]. The presence of this policy causes various related parties to immediately provide alternative solutions so that learning activities can take place even without face to face. The alternative solution in question is in the form of learning activities which are carried out online [9]. The solution is intended for all levels of education ranging from early childhood education to tertiary institutions [10]. Learning conducted online are the implementation of learning by eliminating time and distance by utilizing electronic learning (e-learning) in internet based order to be able to support the learning process without physical interaction [11].

Learning online really need good cooperation between all parties, both from the lecturers and students. This condition causes all learning to be technologically literate, required to be creative in delivering material through online learning media, and be able to read student situations and conditions [12]. In addition, students must also provide information related to family conditions, the economy, and the state of the internet. This is very important so that learning can provide waivers and substitute assignments. The problem in the world of learning is that the learning process is not uniform, both the standard and the quality of the desired learning outcomes [13], [14].

Online learning, especially during this pandemic, really need the support of various electronic devices, such as smartphones and laptops. This electronic device can be used to access a number of information anytime and anywhere. The use of electronic-based technology makes a major contribution to the world of education [15]. The intended contribution is the achievement of learning goals and has a positive impact on students [16].

In order for the implementation of online learning to take place optimally, the use of various e-learning also needs to be done. There are various types of e-learning as a medium in the implementation of online learning. E-learning is defined as a learning system that uses electronic devices for learning media [17]. E-learning is a type of teaching and learning that allows the delivery of teaching materials to students using the internet, or other computer network media. Utilization of media e-learning through computers or smartphones in the learning system can become independent learning students [18]. E-learning provides easy and fast learning for increased access to lectures, and clear accountability in the learning process [19]. E-learning has several characteristics, namely: i) Utilizing electronic technology, computer networks and digital media; ii) Using independent teaching materials and stored on computers or smartphones that can be accessed by lecturers and students anytime anywhere; iii) As well as utilizing learning administration either schedule, curriculum, learning progress, to be viewed at any time on a computer or smartphone [20]. There are several applications and digital platforms used by learnings in the midst of the COVID-19 outbreak, namely WhatsApp group, Google Classroom, Google Meeting, Edmodo, Zoom Meeting, Schoology, Microsoft Teams, Moodle, and so on [21].

Modular Object-Oriented Dynamic Learning Environment (Moodle) is a distance learning application that has very interesting features, besides being easy to use, Moodle also has complete learning objects such as pre-tests, materials, videos, discussion forums, post-test, assignments, quizzes, and electronic journals [22]. In addition, Moodle is also an open-source application with a learning management system (LMS) platform under the GNU Public License. The Moodle application can be downloaded from the Play Store on an Android smartphone and can be installed on a personal computer (PC). Lecturers can easily design online learning using the Moodle application, because it uses the Java programming language [23]. The Moodle application LMS platform allows lecturers to design online learning that is more interactive, not only sharing material, but also designing semester learning plans and lecture program units according to the academic calendar. The Moodle application has chat and messaging communication features that can connect lecturers and students anytime and anywhere [24].

One of the subjects that forms the foundation for achieving the main competencies in research methods science is the research methodology course for engineering education students. This course provides students with the fundamental knowledge to practice standard research concepts such as creating research proposals, conducting field research, processing data, analyzing data, and reporting research [25]. The effect of using Moodle on the performance of research methodology college students at Medan State University in Medan, Indonesia was explored in this study. We also wanted to see how they felt about Moodle in terms of its usability, usefulness, and accessibility. The three research questions were attempted to be answered: i) What impact does Moodle have on the research methodology performance of college students enrolled in major electrical engineering education?; ii) What impact does Moodle have on the research methodology

performance of college students enrolled in major building engineering education?; and iii) What are college students' responses about Moodle?

2.   RESEARCH METHOD

The Technology Acceptance Model (TAM), first designed to analyze the acceptability of new technology, serves as the theoretical foundation for this research. Davis created this popular model [26]. Its foundation is the Theory of Reasoned Action (TRA), which looks into how humans consider the utility and usability of new technology [27]. The degree of improvement in students' performance following the use of new technology is measured by utility, as well as the degree of access to new technology is measured by simplicity. TAM was utilized in this study to determine the utility and acceptance of Moodle among Engineering Education students.

We used a quasi-experimental design in this study and analyzed the data using a one-group pretest-posttest design. A two-stage informative consecutive plan was utilized. During the primary stage, information was accumulated by directing an exploration technique test when the execution of Moodle. In the second phase, we offered a questionnaire based on a five-point Likert response scale system to collect student comments on Moodle use in terms of its ease of use, usefulness, and accessibility; this was done only after the intervention. A quasi-experimental approach is appropriate for investigating one group of participants with no comparison group. The current research was carried out at Medan State University (UNIMED) in Medan, Indonesia in the academic year 2019-2020. A total of 86 Engineering Education college students from the Technic Department. The students were in the age group of 22–26 years and are identical in terms of mother tongue, educational attainment, years of schooling research methodology in UNIMED, and displaced people.

2.1. Data collection and sampling

This study used a comfort examining technique, which is otherwise called purposive, specific, critical, or abstract testing. It mirrors the strategy for nonprobability examining, which centers on testing methods where members are picked in light of their accessibility and the accommodation of the analyst. Albeit this sort of testing is less attractive than that of different kinds of inspecting methods, it can address the examination questions in view of the specific attributes of the number of inhabitants in interest [28]. We utilized convenience sampling in this study because it was the only technique accessible for the research methodology course.

A series of surveys, a research technique test, and a questionnaire were used to collect quantitative data. The research methodology test was used to collect data from lectures about the students' performance in research methodology, and the questionnaire was used to collect data on the students' reactions to the Moodle App. The research methodology of the test consisted of 60 multiple-choice questions. The researchers estimated the tests' psychometric properties (difficulty and discrimination parameters) after administering them to a pilot group of 40 students to ensure their reliability. We also created an attitude scale questionnaire with a checklist filling format and a scale Likert assessment to collect data on students' reactions to the app in terms of its simplicity of use, utility, and accessibility. It was made up of 16 items that were divided into three categories: usefulness, convenience of use, and accessibility. A jury of university lecturers was asked to comment on the questionnaire, which was used to validate it. Their suggestions were taken into account, with some elements being deleted and others being added. The validity results obtained are r_{count} of 0.497. For the r_{table} value of 40 students is 0.320. In accordance with the rules of instrument validity, if $r_{count} \geq r_{table}$ and vice versa. The whole research questionnaire is valid where $r_{count} > r_{table}$ (0.497>0.320). A pilot sample of 40 students was chosen to test the questionnaire's dependability. The scale's dependability was determined using Cronbach's alpha, which varied from 0.84 to 0.89 for domains and 0.91 for the total scale. This suggested that the survey was fairly trustworthy[29].

2.2. Moodle intervention implementation

The instructor of the research methodology course met with the students during the third week following the add/drop period to explain the requirements for passing the course in this study. Students were informed that they would have a three-hour face-to-face class with the lecturer and a one-hour session at the learning and teaching center. In addition to completing each subject, students were required to complete a research methodology project. We used Google Forms and Docs. Because this was the students' first-time using Moodle, the instructor assigned them to the learning and teaching center for the second class. Students were given the option of selecting a convenient time based on their availability and free time. Each student was given the task of creating a fresh Google's email (Gmail) account by the instructor. The students were given the code to join the class once they had created their Gmail accounts. The lecturer next demonstrated how to utilize Moodle to submit assignments during the course. To address the three research questions in

this study, we used the Statistical Package for the Social Sciences (SPSS Version 21) software. For both the demographic and response data, mean, standard deviations, frequencies, and percentages were calculated. A paired sample t-test was used to determine whether there were significant differences between the pre and post-test research methodology assignments.

3.   RESULTS AND DISCUSSION

The impact of Moodle on research methodological performance was investigated of Electrical Engineering Education (EEE) students in the academic setting by identification their pre and post test scores research methodology. Table 1 represents the participants' overall pre and post test scores research methodology performance and also shows the results of the paired samples t-test, which revealed a significant difference between the means of the students' pretest and posttest scores. With an effect size of about, this means that the posttest scores were 46.50% higher than the pretest scores.

Table 1. Result EEE students' pre and post-test research methodology

Research methodology EEE class	Mean	SD	t-test	Size effect	Sig
Pre-test	35.14	13.050	17.045	46.50%	0.000
Post-test	47.93	19.588			

*Sig. (α≤0.05).

By assessing their pre and post test results in the research methodology test, we investigated the influence of Moodle on the research methodology performance of Building Engineering Education (BEE) students. Table 2 shows the student's total score for research methodology performance before and after the test and also displays the paired samples t-test findings, which revealed a significant difference between the students' pretest and posttest scores. With an effect size of 43.82%, the posttest results appear to be better than the pretest results. By assessing students' responses to 16 items in three categories (usefulness, ease of use, and accessibility) at post-test following Moodle adoption, we quantitatively assessed Engineering Education students' attitudes regarding Moodle. To solve this issue, descriptive statistics (means and standard deviations) were calculated from the students' responses to the Moodle questionnaire domains.

The ease-of-use domain was placed top in Table 3 based on the average (4.57±0.23). The second most important domain was usefulness (4.27 ± 0.25). However, the accessibility mean score (4.18 0.38) was regarded as the lowest. According to these findings, the students' responses had an average mean score of (4.34±0.29). Table 4 reveals that the ease-of-use domain was ranked top (4.61±0.395) and the usefulness domain was placed second (4.43±0.28) based on the mean value. The accessibility mean score (4.21±0.29), on the other hand, was regarded as the lowest. According to these findings, the students' responses had an average mean score of (4.41±0.32).

Table 2. Results BEE students' pre and post-test research methodology

Research methodology test BEE class	Mean	SD	t-test	Size effect	Sig
Pre-test	33.84	12.877	14.357	43.82%	0.000
Post-test	42.40	24.212			

*Sig. (α≤0.05)

Table 3. Results EEE students' responses

No	Variables	Mean	Std. Dev	Level	Grade
1	Ease domain responses	4.57	0.231	High	1
2	Usefulness domain responses	4.27	0.256	High	2
3	Access domain responses	4.18	0.386	High	3
	Total	4.34	0.291	High	-

Table 4. Results BEE student's responses

No	Dependent variables	Mean	Std. deviation	Level	Grade
1	Ease domain responses	4.61	0.395	High	1
2	Usefulness domain responses	4.43	0.281	High	2
3	Access domain responses	4.21	0.293	High	3
	Total	4.41	0.323	High	-

In terms of descriptive statistics, the student responses of simplicity of use, usefulness, and accessibility are shown in Tables 5 and 6. Table 5 shows that the EEE students' overall impressions of Moodle was rated favorably in terms of utility, ease of use, and accessibility. The majority of BEE students assessed Moodle well in terms of usefulness, simplicity of use, and accessibility, as indicated in Table 6.

Table 5. EEE students' responses

No		Dependent variables	Mean	Std. deviation	Level	Grade
6	Usefulness	Moodle helps me in improving my research methodology skills	4.86	0.35	High	1
3	items	Moodle can be useful for both teaching and learning	4.42	0.49	High	2
9		Higher education should use Moodle	4.42	0.49	High	3
4		I find Moodle! Helpful	4.3	0.88	High	4
7		Moodle helps me on create my thesis	4.28	0.45	High	5
8		Activities on Moodle are helpful	4.14	0.35	High	6
2		I'm excited to use Moodle in future classes	4.12	0.85	High	7
1		I enjoy doing activities on Moodle	3.98	0.77	Mid	8
5		I find Moodle! useful	3.98	0.77	Mid	9
10	Ease of use	I believe the activity directions are clear	4.72	0.45	High	1
12	items	Using Moodle application easy	4.56	0.5	High	2
11		When I submit my project on Moodle, I feel optimistic	4.42	0.49	High	3
13	Access items	On my smartphone, I have Moodle applications	4.72	0.45	High	1
14		Moodle is preferable to paper-based assignments in all courses with assignments	4.42	0.49	High	2
15		In Moodle, I try to react to each assignment or inquiry as quickly as possible	4.28	0.45	High	3
16		I can access Moodle from anywhere at any time	3.72	0.7	Mid	4

Table 6. BEE students' responses

No		Dependent variables	Mean	Std. deviation	Practice degree	Rank
6	Usefulness	Moodle helps me in improving my research methodology skills	4.84	0.37	High	1
3	items	Moodle can be useful for both teaching and learning	4.6	0.49	High	2
7		Moodle helps me on create my thesis	4.49	0.5	High	3
4		I find Moodle! Helpful	4.47	0.79	High	4
9		Higher education should use Moodle	4.44	0.51	High	5
2		I'm excited to use Moodle in future classes	4.4	0.79	High	6
5		I find Moodle! Useful	4.3	0.77	High	7
8		Activities on Moodle are helpful	4.26	0.44	High	8
1		I enjoy doing activities on Moodle	4.19	0.73	High	9
11	Ease of use items	When I submit my project on Moodle, I feel optimistic	4.72	0.45	High	1
10		I believe the activity directions are clear	4.56	0.5	High	2
12		Using Moodle application easy	4.42	0.49	High	3
13	Access items	On my smartphone, I have Moodle applications	4.77	0.42	High	1
14		Moodle is preferable to paper-based assignments in all courses with assignments	4.3	0.46	High	2
15		In Moodle, I try to react to each assignment or inquiry as quickly as possible	4.21	0.41	High	3
16		I can access Moodle from anywhere at any time	3.56	0.88	Mid	41

Despite the fact that Moodle is widely utilized in the educational sector, very few studies on its usefulness have been undertaken. Furthermore, the majority of the studies focused on the reactions of students and teachers to Moodle [24], [27], [30]–[35]. This is the first experimental study that we are aware of that looks into the impact of Moodle on the research methodology performance of Engineering Education students in Indonesia. It also tried to find out how students felt about Moodle in terms of usability, utility, and accessibility. Moodle had a favorable impact on Engineering Education students' research methodology responses, according to the findings of the first and second study questions. The research methodology test revealed a significant difference between the mean pre and post-test result of the research methodology, with a post-test effect size of approximately 46.50% and 43.82% for research methodology, respectively.

Several factors can be attributed to the students' improved research methodology performance. First, there was a successful implementation of the Moodle intervention, lecturers were able to use it in conjunction with face-to-face sessions while also uploading the relevant resources. Second, the 16-week duration of the intervention program had a positive impact on the students' responses. Third, Moodle's features are easy to understand and use. This conclusion was backed up by previous researches [36], [37]. Eventually, Moodle was viewed favorably by students in terms of its simplicity of use, utility, and accessibility. Moodle is said to be equivalent in terms of effectiveness [38]. According to their findings, Moodle enhanced students' questions and improved their classroom involvement.

Based on third research question, students rated Moodle positively in terms of usefulness, ease of use, and accessibility. According to the results, students rated Moodle's usefulness first, ease of use second, and accessibility third. These findings coincided with several studies [24], [27], [30]–[35] which confirmed students' overall positive reactions to Moodle. As a result, Moodle's features have encouraged students to accept it [22]. Investigate the viability of Moodle in terms of adoption and use among Portuguese students. Respondents stated that Moodle was useful based on their findings.

Furthermore, previous researchers [36], [37], [39] investigated the effectiveness of active learning activities for data mining subjects using the Moodle application. The majority of students were happy with Moodle's features, according to their research. Finally, Moodle's features, the program's clear and successful implementation, and students' and lecturers' good reactions to Moodle all led to students' improved research methodology performance. As a result, understanding the aims of employing technology in the classroom is crucial. Furthermore, knowing how to use technology effectively might help to improve the teaching and learning process [40], [41].

4. CONCLUSION

According to our findings, Moodle is an innovative and successful online platform for improving Engineering Education students' research approach responses. Students rated Moodle favorably in terms of utility, ease of use, and accessibility. The performance of research methods was improved due to a variety of circumstances. For instance, consider the method of implementation Moodle's intervention, as well as the length of time it took to implement it (one semester), ensured good outcomes, an effective set of Moodle features, and students' positive reactions to Moodle in terms of its usefulness, ease of use, and accessibility.

Living without modern teaching and learning tools is unavoidable in our digital world. As a result, as all colleges try to experience new online platforms, understanding new technologies and how they work in the classroom has become a must. The findings of this study showed a practical implementation of Moodle as an emerging online platform in an engineering classroom. Gaining a competitive edge requires a thorough understanding of technology.

This study does have some flaws. Because the sample size was small and data collection was limited to Medan State University students, the findings of the study cannot be generalized. As a result, future research should be conducted with a bigger sample size and in a variety of settings. Future studies should also take into account teachers' attitudes toward Moodle. Various quantitative and qualitative data collection approaches should be presented.

For numerous reasons, experimental investigations should be prioritized. They could, for starters, give a clear structure for implementing Moodle in classrooms. Second, experimental studies could assist teacher's better grasp how to use this new tool. Finally, experimental research could provide constructive input on the success of this new online platform to instructors, educators, and policymakers.

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