Teaching using moodle in mathematics education

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Abstract. The aim of this study is to determine the effect of Learning Modeling System (LMS) Moodle in learning. The population is taken from all students of Mathematics Education, University of PGRI Semarang. The sample was randomly selected from five different course groups. The initial score is taken from the semester test, and the final score is taken through the semester test after the five groups are taught using Moodle. The results of both test results are compared to find out the increase in learning outcomes. Meanwhile, the student's attitude toward learning is taken through his mathematical disposition through questionnaire. The results show that there was a significant increase in exam results on the final exam of the semester. This result is supported by student learning interest which increases on average after using LMS Moodle taken from disposition data.

1. Introduction

Currently, the progress of technology in education has developed rapidly. In ancient time, we have to bring a lot of books everywhere we want to read them. Now, we can open e-book on computers, laptops, tablets and smartphones. Also, availability of internet services in smartphones and tablets with cheap rates and easy access provide students to obtain any information easily, anytime and anywhere.

Learning by utilizing internet technology improves knowledge and skills in the study. It was reported that students referred to face-to-face learning if they have already understood the science concept or mastering in application. In contrast, when self-learning skill was obtained, they refer to online learning [1]. The learning process by utilizing the internet show a positive impact in student achievement. On the other hand, Moodle-based learning is useful for providing personalized content based on student learning background and objectives. In this condition, education is focused on the content of knowledge and causal effect to find a plan, the best learning track for each student requirement [2]. Hence, the program of teaching is flexible, the student can select the existing material based on the required information [3,4], and easy to monitor and check the student work [5].

Learning by using technology depends heavily on the appropriate e-learning software for students [6]. The study confirmed that by using e-learning, knowledge repositories have a high frequency of use and this shows e-learning is a useful method of knowledge transfer [7], and adaptive e-learning system [8]. Study groups using technology outperformed other groups that did not use technology. However, there was no statistically significant difference between the achievements of the two groups [9]. Innovative, easy-to-use and affordable teaching strategies can be used to motivate, and retain students' interest [10]. In this case, student satisfaction is the primary goal of the modern education and can be achieved with a combination of face-to-face teaching and using an LMS like Moodle [11].
Moodle is an ideal learning management system that consists of many functions and can achieve through simple architecture. Learning by using the LMS Moodle enhances classroom preparation, classroom learning and learning. Intrinsically accessible and available self-learning features motivate students to use e-learning portals for further education. If students do not have to go anywhere to do their work and no money to win, this will increase their learning motivation [12]. In learning with this strategy, all students contribute, although tech support from the instructor is required. Reporting of learning activities through Moodle and weekly quiz results shows in a way that results in better exam results [13]. Students can continue to update their learning outcomes, on the other hand assisting the teacher's principal to perform similar tasks for each student. With a forum for students, they can discuss with a community of like-minded duties [14]. Judging from the level of effectiveness, learning on a Moodle basis improves the average of learning outcomes. These results compared with a class that did not use Moodle in the learning process [15]. However, research related to student attitude toward Moodle application usage in learning has not been studied by the previous researcher. In this article, we discussed the effect of Moodle-assisted learning on student outcomes. Another discussion is the effect of the mathematical disposition of students on mathematics learning activities.

2. Methods
In this research, a quasi-experimental method was applied for all student Department of Mathematics Education in University of PGRI Semarang. A random sample comprising 165 students from the population of 800 students were selected. The students were then grouped into five experimental classes. The five groups were treated by the Moodle application learning. The conventional learning (without Moodle application) was previously tested, and the first test was held as the initial value. The final value was taken after the learning process using Moodle application. Next, the initial and final values were compared to find out the difference in outcomes of each group after learning using Moodle. This test was performed to understand student's attitude and motivation in learning by using internet technology. Analysis of this disposition attitude using the N-gain test was conducted to determine the increased activity in the learning process.

3. Results and Discussion
Figure 1 shows a comparison of the initial test and the final test in the lesson. According to the figure, it is indicated that there is a very significant increase in the exam results. In the initial test, the lowest value is found in the 2nd class with average value of 37.53 while the highest value is obtained at the 4th grade with an average value of 63.06. Nevertheless, those highest value does not fulfil the B grade criteria since the minimum value of B grade is 70.

![Figure 1. Initial test and Final test.](image-url)
On the other hand, there is a significant increase in the final test. The lowest value of the final test is 70.9, and this value is slightly higher than the minimal value for obtaining B grade (70). Compared to the initial test, the highest mean value in final test is 91.38, obtained in the 2nd class. This class is also considered as class with the highest achievement since at the initial test, this class has the lowest average value. According to the results, it is confirmed use of Moodle in the lecture is beneficial for students and can improve the learning system.

Table 1. N-gain Test Results

| No | Course                  | N-gain | Criteria |
|----|-------------------------|--------|----------|
| 1  | Numerical Methods       | 0.43   | Middle   |
| 2  | Algorithm               | 0.88   | High     |
| 3  | Theory of Probability   | 0.63   | Middle   |
| 4  | Differential Equation   | 0.33   | Middle   |
| 5  | Theory of Ring          | 0.41   | Middle   |
|    | Average                 | 0.54   | Middle   |

Table N-gain test results is shown in Table 1. It is found that for the first class (numerical method) has the N-grain value of 0.43 indicating medium criterion or the increase is medium. Similar medium criterion is also shown for Theory of Probability, Different Equality as well as Theory of Ring. On the other hand, the Algorithm achieves a high increase of 0.88. This great increase occurs because the course is directly related to learning using a computer, so students can directly access the internet network to find sources of information associated with the tasks. Another learning subject such as Numerical Methods, Differential Equations, Theory of Probability, and Theory of Ring, students do not directly utilize the computer in doing its tasks. Hence, there is a tendency that students are directly connected to computer and internet in solving their study task. This is shown due to significance improvement of the student results after LMS Moodle implementation. However, in Differential Equations course, the improvement is the lowest compared to other subject courses. This because the Differential Equation problems are solved manually and not depend on computer and internet access.

The increase in learning outcomes is also evident from the N-gain scores on the mathematical dispose scale after learning using Moodle (Table 2). The average accurate dispose level is 28.63 out of five courses. The increase, in particular, disposes of included in the high category. From the degree of perception of students' high learning math perception after learning using LMS Moodle. Students are excited and eager to learn math by using media such as LMS Moodle. With LMS Moodle, students can learn anywhere to do tasks and send assignments to their lecturers or discuss in forums provided.

Table 2. Level Dispose of Student Mathematics.

| No | Course                  | N-gain | Level |
|----|-------------------------|--------|-------|
| 1  | Numerical Methods       | 27.88  | High  |
| 2  | Algorithm               | 29.07  | High  |
| 3  | Theory of Probability   | 28.44  | High  |
| 4  | Different Equality      | 28.81  | High  |
| 5  | Ring of Theory          | 28.96  | High  |
|    | Average                 | 28.63  | High  |

4. Conclusion

Learning by using internet technology provides insight to students. Through the internet, students can learn anytime and anywhere without having to go face-to-face with the teacher. Learning with Moodle improves student participation in learning activities. Student activities such as dispatching assignments,
discussion on forums make students’ appeal in learning. Moodle-based learning improves student learning outcomes.

5. References

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