



Implementation E-Learning Based Moodle on Physics Learning in Senior High School

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ABSTRACT

The problems faced today by Indonesian teachers are the difficulty of implementing e-learning in the learning process, especially physics learning. During this time the teacher considers using e-learning in the classroom will not be effective. This study aims to explain how the implementation of physics learning by using Moodle-based e-learning in the learning process. In this study, it divided into two aspects, namely learning outcomes and interest in learning with physics learning material in rectilinear motion. This study uses an experimental class design with a sample size X class of 10 students of Public High School 1 Piyungan group chosen randomly. This study used the design of one group pretest and posttest using the T-Test while the significance value using N-gain analysis scores and learning interests obtained from the questionnaire. The results of the analysis show an increase in learning outcomes with very high N-gain significance values. Then the percentage of student learning interest reaches 66% which is in the excellent category. So it can be concluded that the application of moodle-based learning can increase learning interest and learning outcomes and 73% of students agree if knowledge based on Moodle applied in the learning process.

Keywords: e-learning, Moodle, learning management system, learning outcomes, interest in learning

INTRODUCTION

The development of technology in the world of education many new technologies have emerged. The technology comes with a period that serves to facilitate the learning system in the form of a process of interaction between teachers and students both in the classroom or outside the school. The learning model is a learning management system based learning or called E-learning.

E-learning is an education system that can be accessed using the internet which can store or re-emerge, distribute, share knowledge and information that is useful for maximizing forms of distance learning (Kapezovich & Toktarbekovna, 2014; Wolfe & Cedillos, 2015). The purpose of E-learning is to make it easier for teachers to

deliver learning material at any time and can be freely accessed (Kapezovich & Toktarbekovna, 2014). Using E-learning helps the teacher in giving assignments, quizzes and builds communication and collaboration between students and teachers (Renata & Jana, 2012; Rodrigues et al. 2018).

However, viewing the facts in the field, there are still many teachers who have not understood the critical meaning of technology in the learning process. The teacher considers that by using learning technology in the form of E-learning, students will not be responsive to the material taught by the teacher. Many restrictions appear when learning technique applied in schools, one of which is the limited human resources in using learning technology and the inability of teachers to

use the given technological tools (Raharja et al. 2011). Of course, this has an impact on teachers and students. While on the other hand learning technology is present to help facilitate teachers and students in the learning process.

Including the existence of learning technology in the form of E-learning, it is easier for teachers to control, supervise and give assignments without having to face to face directly. According to Aminoto & Pathoni (2014) with the existence of learning technology in the form of E-learning helps teachers and students to collaborate interactively, build collaboration communication through internet networks and make it easier for teachers to give lessons both in class or outside.

Teachers and students will be more flexible in the use of learning time which is undoubtedly adapted to learning material and make it easier for students and students to interact with each other through internet networks (Hošková-Mayerová & Rosická, 2015). However, the teacher must be able in choosing material that can be taught through E-learning or must be face-to-face, for example for content with a lot of decreasing formulas; it would be better not to use E-learning.

In the era of globalization and the advancement of education with the ITC and from the facts in the field a learning innovation needed that can facilitate teachers and students in the learning process. One of them is E-learning using Moodle. Learning using Moodle (Modular Object-Oriented Dynamic Learning Environment) is a form of learning management system in the type of open source as E-learning platforms in which there are supporting features in accommodation in one portal (Al-Ajlan & Zedan, 2008). These features are in the form of assignments, quizzes, collaboration communication and the main features that can upload various formats of learning material (Costa et al. 2012).

Moodle has several advantages compared to other E-learning media. Some

of the benefits of Moodle are that teachers can change and organize learning material directly, easy to install, free, efficient. So that anyone can learn for learning and Moodle activities in addition to the form of websites also available in the way of android so that it makes it easier for teachers and students. The process of learning and also equipped with some additional features that can access the wiki space, WordPress and blogs (Safitri et al. 2014; Šumak et al. 2011).

At present, several researchers have studied and developed Moodle in learning (Lo'pez et al. 2016). Lo'pez et al. (2016) examine the use of Moodle in learning physics, mathematics, and engineering. Also, there are also those who develop Moodle in the process of learning basic physics in higher education (Herayanti et al. 2017).

The researchers tended to ignore the collective influence of variables related to learning outcomes and interest in learning in the learning process. Some of these studies still have some disadvantages that need to be improved in performance, among others, providing learning resources in the form of modules, simulations and questions are still lacking, and interactions between students and teachers through chat forums in the Moodle application are even less efficient in its use. Furthermore, as long as the use of E-learning in the form of Moodle, its purpose is only dominated by the university environment while at the secondary school level it is still very rarely used especially in physics learning.

That is the experience of researchers interested in conducting a study of the implementation of Moodle-based E-learning in physics learning in high school with the aim of obtaining an overview of the Moodle-based physics learning system in schools whose ultimate goal is to improve student learning outcomes and learning interests.

METHOD

Research Design

This type of research is an experiment using quantitative descriptive data which tested on 10 grade X students of public High School 1 Piyungan with a review of interest in learning and learning outcomes. The study attended in October - December 2018. The research used to place at Public High School 1 Piyungan Yogyakarta. The learning material is in the form of physics material in the high school class X 2013 curriculum which includes the subject of the motion. The study design used one group pretest-posttest design as shown in equation (1) as follows:

$$O_1 \quad X \quad O_2 \quad (1)$$

Where, O_1 = Results pretest; O_2 = Results posttest; X = Treatment is given

Research Instruments

The research instrument was in the form of a learning outcome test that contained questions about the pretest and posttest and questionnaires in which there were several questions related to the interest in learning physics. Analysis of learning interest using surveys with scoring guidelines using numbers namely 4 (strongly agree), 3 (agree), 2 (less agree) and 1 (disagree). Then to test how much influence the learning media used on learning outcomes then used a paired T-test. Furthermore, to determine the significance value of learning outcomes using N-gain value and to find out how much percentage of interest in learning after using e-learning based on Moodle, equation (2) used as follows:

$$X = \frac{A}{B} \times 100\% \quad (2)$$

Where X = percentage score achieved; A = The number of scores obtained; B = Maximum number of scores

Research procedure

The research process starts with studying the Moodle application on

Android. Students log in using the account that obtained through admin, then in the Moodle application students click on the source in which there are several forum features used as discussion rooms. Quiz features are used to give quizzes in the form of wrong questions only the pretest and posttest questions.

The assignment feature is useful for helping teachers to provide information on assignments given, lesson features to provide information about what experiences taught, and in them, there are reference lessons that can be downloaded by students, and during the Moodle application equipped with chat feature to have a conversation between teacher and student. In the moodle app, it supported on several supporting functions, such as the book, file, URL, page, Glossary features, including learning videos and feedback features.

Next to introducing Moodle to students, then conduct a pre-test and proceed with the application of moodle in the physics learning process, after which a post-test test is carried out, and a questionnaire is given to students to review students' interest in e-learning used in the learning process.

RESULT AND DISCUSSION

Implementation of Moodle in teaching Physics

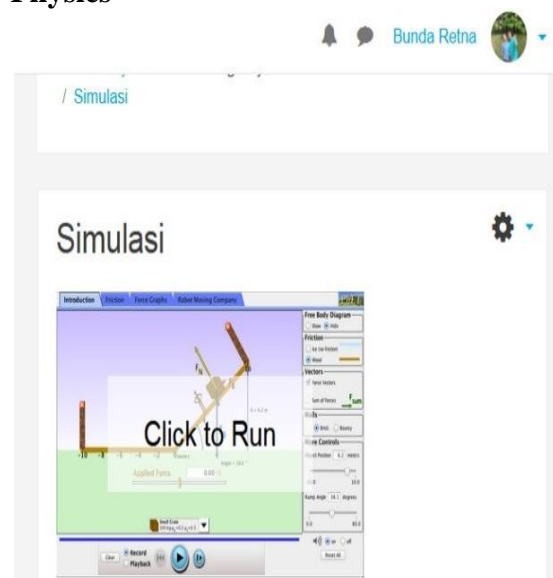


Figure 1. Simulation of learning physics

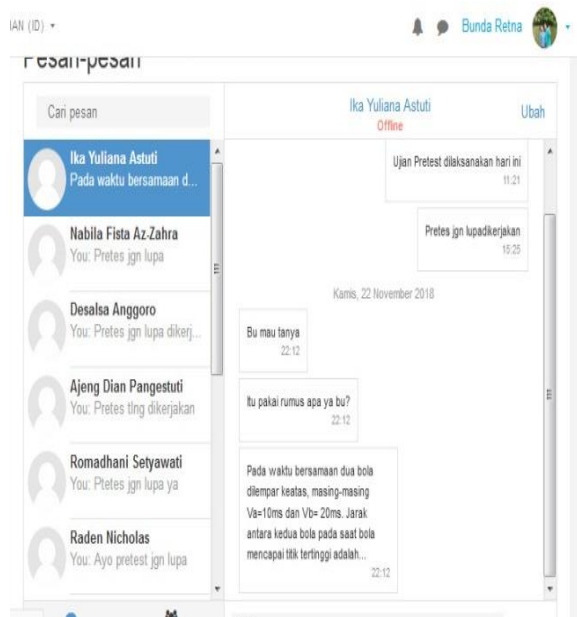


Figure 2. Discussion between students and teachers use Moodle

Figure 1 describes that with the process of learning physics by using Moodle-based E-learning. Moodle has many benefits, as in Figure 1 with can include simulations in the E-learning learning process. That creates it easier for students to understand the concepts learned even without having to face to face in class. On the other hand with complicated physics learning Moodle can be made in the form of simulations so that students are accessible to learn without having to come face to face directly.

The Moodle application also equipped with a variety of complete features and the material taught can be arranged systematically according to the learning phase. Physics learning by using Moodle allows teachers to effectively manage new student curriculum, support control various sources of information and can facilitate information about students involved in learning activities (Cherniavskyi, 2017).

Besides, by using Moodle students can interact such as asking questions, sending assignments and completing tasks given by the teacher (see Figure 2). Also, using Moodle is equipped with an online quiz making the feature with an attractive appearance and students can get the results of the work done directly by students. One of them is that students can see how many

correct answers and the number of incorrect answers and can be interpreted again how many students are in each item such as Figure 3.

3. Sebuah benda bergerak lurus beraturan dalam waktu 10 sekon dan menempuh jarak 80 meter, kecepatan benda tersebut adalah

7 tanggapan

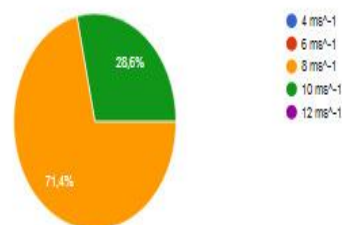


Figure 3. Quiz the teacher; (b) Learning material that arranged systematically

Teachers can improve the Moodle platform by realizing web-based assessments. These works are used to enhance students cognitively, improve students build knowledge, and promote students' positive attitudes towards discussion and working with peers. It is evident that students improve students' skills to conduct learning using information technology (Martín-Blas et al. 2009).

Singh (2016) states that the mood in education can improve student learning experiences, increase student participation, can interact quickly and can combine some content that can help the learning process Moodle has a variety of benefits in the learning process. While said by Zakaria & Daud (2013) that Moodle can be obtained free of charge and can implement in every learning process. Moodle provides services that are different from other types of E-learning Moodle has more complete features compared to others such as task items, chat, forums, databases, glossaries, lessons, various kinds of tests with one or more issues, quizzes, wikis, surveys, and modules (see Figure 2 and Figure3) (Paragină et al. 2011; Berggren et al., 2005).

Therefore, physics learning using E-learning based on Moodle influences the process of developing learning technology and can implement Moodle in a system of learning systems in ordinary schools.

However, it recognized at implementing Moodle in learning especially physics learning teachers must systematically arrange learning instruments to facilitate the teacher in teaching physics material. So it is essential that the teacher's ability to operate Moodle is needed. The interaction between teacher and students is more satisfying thus improving students' interest in learning to continue asking.

Analysis of learning outcomes

Determine the learning outcomes the pre-test and post-test tools used. The following presented data on the results of the pre-test and post-test analysis of students on physics learning material (direct motion) using Moodle (Table 1).

Table 1. Data on student learning outcomes

No	Initials	Pretest	Posttest	N-gain
1	NFA	57	100	1.00
2	SD	43	86	0.75
3	RNK	57	86	0.67
4	IY	30	71	0.60
5	RS	57	86	1.00
6	KA	43	86	0.75
7	AH	43	100	0.75
8	SH	43	86	0.75
9	DA	29	86	0.80
10	NF	57	86	0.67

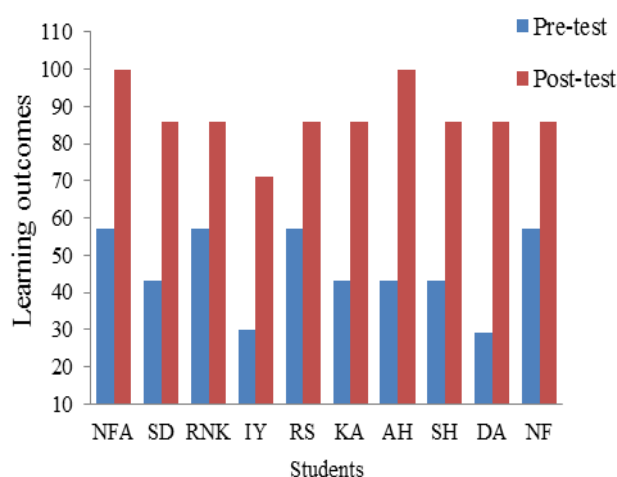


Figure 5. Results pretest and posttest

Based on Figure 5 can be seen there was an improvement in student learning outcomes during the e-learning based learning process. Furthermore can be seen in the assessment category the significance

of learning outcomes is in the high grade (Figure 6).

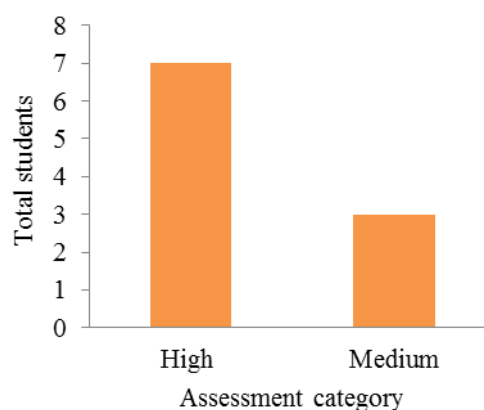


Figure 6. N-gain graph normalized value

The proves that the use of Moodle-based e-learning can apply in school learning. Lin et al. (2016) suggested that one element that can improve learning outcomes is the use of learning media that integrated with computerized systems. The expression Lin strengthens this argument at Lin et al. (2017) that digital learning in which there are an automated system and mobile technology can improve learning outcomes and learning motivation. Therefore, the role of technology is essential to supporting the learning process in the classroom, and to be able to develop students' competencies in understanding the concepts explained. Furthermore, to determine the effect of using e-learning on learning outcomes, it was analyzed using a pretest and posttest T-test as shown in Table 2.

Table 2. Results of paired T-test analysis

Paired samples test									
Paired differences									
		Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pre Test - Post Test	-4.14000E	10.31935	3.26326	-48.782	-34.01	-12.68	9	.000

From Table 2 it is obtained $p < 0.00$, which means that it is smaller than 0.05 so that it explained that there are differences between the results of physics learning pre-test and post-test. From the results of the pretest and posttest, it appears that there is an increase in the results obtained by students, from the ability of the fundamental knowledge possessed by students and the final ability after students learn the material of rectilinear motion using E-learning. The indicated by the results of the data processing using the sample paired T-test, obtained p-value = 0,000 which means that by the proposed hypothesis, there is a relationship between the use of E-learning based learning media and student learning outcomes.

The data interprets that learning by using Moodle-based E-learning has an impact on student learning outcomes. They are supported on the research of Sulisworo et al. (2016) Suggesting that using Moodle-based E-learning can improve student learning outcomes. Moodle based E-learning provides opportunities for students to take an important role to support the learning process. In addition, the main factors that influence the improvement of learning outcomes using Moodle-based learning are how the learning system organized, the content systematically arranged, the ease of students in accessing material and completing assignments, the use of technology-based platforms in learning, new learning experiences for students because it uses E-learning and active involvement of students in interacting (Lim et al. 2009; Xu, 2016).

This will means that student presented the freedom to decide when to start when

to finish, and which parts of the material must be studied first. Students generally will start from an interesting topic first, or can only pass the part they mastered. If they find it difficult to understand some parts, they can repeat until they know or discuss with other group members and use will make it easier for students to consider.

Analysis of interest in learning

Students' interest in learning analyzed from the questionnaire questions given to students. Questionnaires were then analyzed and made in the form of a percentage interest in education and interpreted in graphical style as displayed in Figure 7.

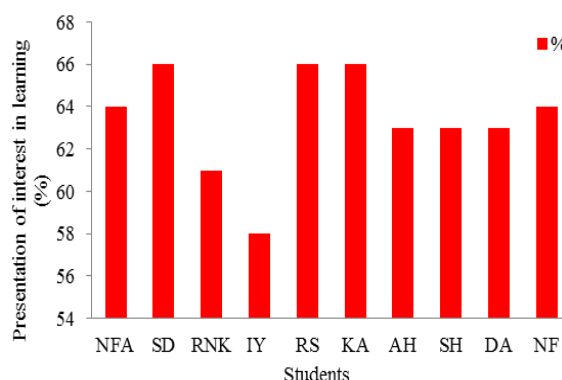


Figure 7. Graph presentation of Moodle implementation in physics learning

Based on Figure 6, the percentage of students' interest in learning using the moodle-based E-learning implemented in 10 students of class X of SMAN 1 Piyungan. The highest rate is 66%, and the lowest is 58% in the good category. Data confirmed by the research of Fitriastuti & Sulisworo (2017), explaining that the achievement of test participants in learning media users is 76-100% in the very good

category, 56-75% in the good category, 40-55% in the poor category and 0-39% in the bad category.

From the graph, I am interpreting that the use of moodle-based learning can increase student learning interest. One of the factors is moodle-based learning, the learning system can anywhere and anytime and students can interact or discuss with the teacher or classmates can be done anywhere without having to face to face in the classroom. Rudhito (2018) revealed that moodle is very helpful in the process of learning, one of the indicators is that students are quite severe in giving comments and suggestions to improve the performance of groups and other groups receive feedback and suggestions gratefully and with open hearts, ideas, and input submitted, uploaded, and discussed in the Moodle Forum.

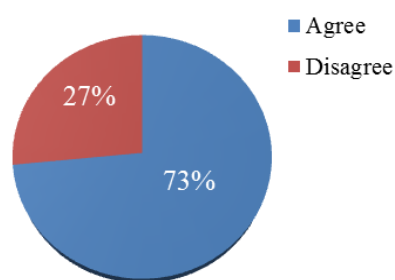


Figure 8. Percentage of student responses regarding the application of e-learning in learning

Figure 8 explains that the percentage of student responses regarding the application of Moodle-based e-learning in learning. Based on Figure 7, 73% of students agree that moodle-based e-learning applied in physics learning. While 27% of students, did not agree that e-learning applies in education. Students who agree assume that referring to learn in knowledge will facilitate interaction during the learning process outside. Gamage et al. (2014) support the reason., that e-learning has an exciting learning system that can foster interest in learning because it is supported by adequate technology so that students and teachers can interact more so students can find something meaningful in the learning process (Gamage et al. 2014). While students who choose do not agree to

assume that learning with e-learning will make students lazy to learn and the concept of learning cannot absorb optimally

In addition, communication between teachers and students play an essential role in increasing students' interest in learning, teachers must actively participate in supporting education, teachers must respond to questions given by students quickly in a discussion forum, and teachers must provide feedback to students (Holbl, 2012; Waheed et al. 2013).

The next process is interviewing several students to listen to the perceptions of the students of Public High School 1 Piyungan when using Moodle in the learning process. According to students by using moodle-based E-learning in physics learning students feel motivated to learn, students can discuss with friends and teachers in learning, learners gain new experiences with e-learning learning, students want for other subjects to use e-learning learning. However, there are also shortcomings in E-learning learning with Moodle that at the beginning of learning students do not understand the use of Moodle so students must guide during the initial learning process.

CONCLUSION

Based on the results of observations it concluded that E-learning learning with Moodle has a positive response, students feel happy and motivated in education, so students are easy to understand the material delivered by the teacher and the learning outcomes will increase. Need to improve the internet network in SMAN 1 Piyungan Yogyakarta so that students can easily access the internet network so that learning in school with Moodle has no impediments

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REFERENCES

- Al-Ajlan, A., & Zedan, H. (2008). Why moodle. *Proceedings of the IEEE Computer Society Workshop on Future Trends of Distributed Computing Systems*, 58–64.
- Aminoto, T., & Pathoni, H. (2014). Penerapan Media E-Learning Berbasis Schoology Untuk Meningkatkan Aktivitas dan Hasil Belajar Materi Usaha dan Energi Di Kelas XI SMAN 10 Kota Jambi. *Jurnal Sainmatika*, 8(1), 13–29.
- Berggren, A., Burgos, D., Fontana, J. Hinkelman, D., Hung, V., & Hursh, A. (2005). Practical and Pedagogical Issues to Teacher Adoption of IMS Learning Design Standards in Moodle LMS. *Journal of Interactive Media in Education*, 02, 1–24.
- Cherniavskyi, V. (2017). E-Course Based on the Platform Moodle in Teaching Physics to Future Specialists or River and Sea transport. *Information Technologies in Education*, 1(30), 122–134.
- Costa, C., Alvelos, H., & Teixeira, L. (2012). The Use of Moodle e-learning Platform: A Study in a Portuguese University. *Procedia Technology*, 5, 334–343.
- Fitriastuti, N., & Sulisworo, D. (2017). Pengembangan Aplikasi Pembelajaran Game Kuis Fisika Berbasis Android Pengembangan Aplikasi Pembelajaran Game Kuis Fisika Berbasis Android Pada Pokok Bahasan Impuls dan Momentum Siswa Kelas XI SMA. *Prosiding Seminar Pendidikan Fisika, Fisika, dan Aplikasinya*, ISSN: 2085(November 2016), 99–102.
- Gamage, D., Fernando, S., & Parera, I. (2014). Factors affecting effective eLearning: Learners Perspective. *Scientific Research Journal*, II(V), 42–48.
- Herayanti, L., Fuadunnazmi, M., & Habibi. (2017). Pengembangan Media Pembelajaran Berbasis Moodle pada Mata Kuliah Fisika Dasar. *Journal Cakrawala Pendidikan*, XXXVI(2), 210–219.
- Holbl, M., Welzer, T., Nemec, L., & Sevcnikar, A. (2012). Student feedback experience and opinion using Moodle. *Proceedings of the 22nd EAEEIE Annual Conference (EAEEIE)*, 1–4.
- Hošková-Mayerová, Š., & Rosická, Z. (2015). E-Learning Pros and Cons: Active Learning Culture? *Procedia - Social and Behavioral Sciences*, 191, 958–962.
- Kapezovich, K. G., & Toktarbekovna, D. T. (2014). E-Learning in the System of the Pedagogical Education in Kazakhstan. *Procedia - Social and Behavioral Sciences*, 152, 179–183.
- Lim, D. H., Morris, M. L., & Yoon, S. (2009). Instructional and Learner Factors Influencing Learning Outcomes within Online Learning Environment. *Journal of Educational Technology & Society*, 12(4), 282–293.
- Lin, J., Yen, M.-H., Liang, J.-C., & Guo, C.-J. (2016). Examining the Factors That Influence Students' Science Learning Processes and Their Learning Outcomes: 30 Years of Conceptual Change Research. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(9), 2617–2646.
- Lin, M., Chen, H., & Liu, K.-S. (2017). A Study of the Effects of Digital Learning on Learning Motivation and Learning Outcome. *EURASIA Journal*

- of *Mathematics Science and Technology Education*, 8223(7), 3553–3564.
- Lo'pez, G. A., Sa'enz, J., Leonardo, A., & Gurtubay, I. G. (2016). Use of the Moodle Platform to Promote an Ongoing Learning When Lecturing General Physics in the Physics, Mathematics and Electronic Engineering Programmes at the University of the Basque Country UPV/EHU. *Journal ScienceEducation Technology*, 25(4), 575–589.
- Martín-Blas, T., & Serrano-Fernández, A. (2009). The role of new technologies in the learning process: Moodle as a teaching tool in Physics. *Computers and Education*, 52(1), 35–44.
- Paragină, F., Paragină, S., Jipa, A., Savu, T., & Dumitrescu, A. (2011). The benefits of using Moodle in teacher training in Romania. *Procedia - Social and Behavioral Sciences*, 15, 1135–1139.
- Raharja, S., Prasojo, L. D., & Nugroho, A. A. (2011). Model Pembelajaran Berbasis Learning Management System dengan Pengembangan Software Moodle di SMA Negeri Kota Yogyakarta. *Pendidikan Dasar*, 41(1), 55–70.
- Renata, B., & Jana, M. (2012). Learning and Teaching with Technology E-learning as a Motivation in Teaching Physics. *Procedia - Social and Behavioral Sciences*, 64, 328–331.
- Rodrigues, M. W., Isotani, S., & Zárate, L. E. (2018). Educational Data Mining: A review of the evaluation process in the e-learning. *Telematics and Informatics*, 35(6), 1701–1717.
- Rudhito, M. A. (2018). Using Exelsa Moodle to Develop Mathematics Teaching Skills and Spirit in the Micro Teaching Course. *International Journal of Indonesian Education and Teaching*, 2(2), 194–205.
- Safitri, M. R., Budiharti, R., Ekawati, E. Y., Fisika, P., Keguruan, F., Sebelas, U., & Surakarta, M. (2014). Pengembangan Media Pembelajaran IPA Terpadu Interaktif Dalam Bentuk Moodle. *Jurnal Pendidikan Fisika*, 2(1), 1–5.
- Singh, E. G. (2016). Moodle as an E-Learning Approach for Training and Education. *International Journal of Innovative Research in Computer and Communication Engineering*, 4(10), 17163–17168.
- Sulisworo, D., Agustin, S. P., & Sudarmiyati, E. (2016). Cooperative-blended learning using Moodle as an open source learning platform. *International Journal of Technology Enhanced Learning*, 8(2), 187.
- Šumak, B., Heričko, M., Pušnik, M., & Polančič, G. (2011). Factors affecting acceptance and use of Moodle: An empirical study based on TAM. *Informatica*, 35(1), 91–100.
- Waheed, M., Kaur, K., AU-Ain, N., & Qazi, A. (2013). Influence of Moodle: Module Features on Student Motivation to Use eLearning System. *Conference: International Conference of Learning International Networks Consortium (LINC)*, 1–13.
- Wolfe, C. R., & Cedillos, E. M. (2015). E-Communications Platforms and E-Learning. *International Encyclopedia of the Social & Behavioral Sciences: Second Edition*, 6, 895–902.
- Xu, H., & Mahenthiran, S. (2016). Factors that Influence Online Learning Assessment and Satisfaction: Using Moodle as a Learning Management System Factors that Influence Online

Learning Assessment and Satisfaction: Using Moodle as a Learning Management System. *International Business Research*, 9(2), 1–18.

Zakaria, E., & Daud, M. Y. (2013). The Role of Technology: Moodle As A Teaching Tool In A Graduate Mathematics Education Course. *Asian Journal Of Management Sciences & Education*, 2(4), 56–52.