



# Implementation of Moodle in Physics Learning: Systematic Literature Review

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**Abstract:** This systematic review study aims to determine Moodle e-learning in physics learning in terms of nationally published journals. This type of research is a systematic review study using the Prisma model. The dominant research methodology is quantitative research with descriptive statistical analysis. The findings in this study are that the author of many articles contains Research & Development (R&D) research on physics learning devices, the distribution of authors and institutions is uneven, and the data obtained is in the form of numbers. Data analysis was performed manually and using Vosviewer software. Data analysis that was done manually included: SINTA level, year, author, institution, use of Moodle, keywords, samples based on educational level, type of research, and data analysis in the research of each article. The results of the article review show that the use of Moodle e-learning is more widely used in the development of teaching materials than used in classroom learning experiments. So it can be concluded that the need for learning development by utilizing the Moodle platform so that learning is more meaningful and enjoyable is not only used only for physics learning training.

**Keywords:** Development; E-learning moodle; Physics; Student

## Introduction

Along with the rapid development of technology, the use of technology in education can be an innovation in the teaching-learning process. Education now requires something interesting and technology-based in teaching so that it can make it easier for students in the learning process that utilizes e-learning (Chelsiyanti et al., 2022). In terms of technological developments in the world of education, many new technologies emerge. This technology comes with a mass that functions to facilitate learning systems in the form of interaction processes between teachers and students, both inside and outside the classroom. This learning model is learning based on a learning management system called e-learning (Fayanto et al., 2019).

E-learning has become the mandatory system operated by any educational institution to deal with the newest demand regarding the leveraging of Information

Technology fast growth. Many benefits offered by e-learning system in the digital era. Some of those benefits are the flexibility and diversity of features, the flexibilities of timeliness, minimize the traveling efforts of learner which is mandatory in traditional learning, imparts the latest policies, ideas, and concepts in real time, and keeps the coursework refreshed and updated as required (Sadikin et al., 2019). As the user demands growth, the requirement of higher capability and capacity of e-learning infrastructures are also increasing day by day. Many methods and architectures have been proposed to overcome the infrastructure capabilities or performance issues. Some of them are a on premise platform, the others are on cloud platform (Sadikin et al., 2023).

E-learning is a medium containing information that conditions students to form their own knowledge and apply the concept of independent learning. The e-learning that can make it easier for students in learning

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is one that can present learning materials in the form of files such as Word, HTML, PowerPoint, pictures, or videos that are interesting (Arifiana et al., 2018).

In this study, the authors will examine the use of e-learning in teaching. The development of e-learning which is supported by using the Internet network produces more and more software that supports the running of the learning system. Among them are LMS (Learning Management System), LCMS (Learning Content Management System), and SLN (Social Learning Network). The software can help teachers to make e-learning systems more effective. Some examples that include LMS are Author and Moodle. As for LCMS, they include Claroline and e-doceo solutions, while for SLN, one of them is Edmodo (Majid et al., 2023).

LMS (Learning Management System) is software without being limited by space and time that can be used to manage teaching-learning activities between teachers and students. One type of LMS that can be used is Moodle. Moodle is an open source Management System (CMS) software commonly known as a Learning Management System (LMS) or Virtual Learning Environment (VLE). Moodle can be used as a dynamic learning environment and the model used is object-oriented. Moodle is considered a useful tool in science teaching because it can assist teachers in the process of delivering science material. The benefits of using Moodle include overcoming the limited frequency of face-to-face meetings between teachers and students (Çelik, 2010).

Moodle is an application program that can convert learning media into web form. This application allows students to enter a digital "classroom" to access learning materials. to access learning materials. Cooperative blended learning model using moodle provides an opportunity for the teacher to present information to recall the concept (Rosmiati et al., 2017).

Moodle makes teaching media accessible via the web with its application programs. Users can access virtual "classrooms" and available learning materials with the help of this application. By using Moodle, an available platform, we can create various learning features such as materials, quizzes, and electronic journals (Mulyatiningsih et al., 2023). Moodle is a powerful platform used for creating and managing courses, controlling student attendance and performance, and controlling assignments and exams. In Moodle, users can enter data such as reading books, learning materials, learning pictures, videos, attendance, and quiz questions for students. Moodle is one of the best LMS platforms that have been developed. According to a survey conducted by (Marnita et al., 2020), Moodle-based LMS is ranked second as the best LMS because of the large number of users and also ease

of operation. In addition, Moodle is also a popular electronic teaching management system implemented by many educational institutions (Darma Kotama et al., 2019).

Based on this explanation, many studies have used e-learning media to know the effect and effectiveness whether or not others when applying in the classroom. So this this research was conducted to find out whether the use of e-learning e-learning media is effective in improve student learning outcomes in the classroom in the classroom from some existing research that already exist. So that teachers can consider using it in the classroom.

Based on the needs analysis in teaching, Moodle is a web that is needed in teaching in today's digital era. Physics is compulsory for exact study programs such as Mathematics and Natural Sciences. This subject examines natural phenomena. At present, physics teaching also needs to experience adjustments from conventional teaching to digital or online-based teaching. Choosing the right teaching platform is the key to achieving learning objectives effectively. Based on this, the authors are interested in studying systematic review research on the topic of using Moodle e-learning in teaching Physics.

#### *Research Questions*

Based on the results of the discussion and analysis of the material, the research question in this article is as follows.

*Q1: How is Moodle E-Learning Used in Physics Teaching?*

#### *Literature Review*

Research in education is now very diverse, and one type of research is a systematic review. Systematic review research is a familiar study that has been carried out by many previous researchers. Systematic review research is flexible and can be adapted to the conditions the researcher wants. The authors found some examples of systematic reviews with several main issues. The research was conducted by Putra et al. (2021) with study material for research on comic media in mathematics teaching, where a total of 44 articles were reviewed. Research by Afrilia et al. (2020) is the study of the use of Kahoot in teaching mathematics, with a total of 19 scientific articles reviewed. Tegar Putra Socrates (2022) conducted research that reviewed 18 articles on the effectiveness of applying physics teaching media based on augmented reality. Research by Dewantara et al. (2021) dealt with the study of physics e-module, in which 38 articles were reviewed. Research by Hisyam Athaya et. al. (2021) dealt with the study of the implementation of Moodle in e-learning, where 52 articles were reviewed.

There are quite a lot of systematic review studies on the study of physics education when compared to systematic reviews on the use of e-learning in physics teaching. Even systematic review research on the use of e-learning in physics teaching was not found. Systematic review research on physics education includes research conducted by Kusni et al. (2022), examining learning in physics education in Indonesia; research conducted by Nadia (2022) with material for research studies on physics learning problems and their solutions during the Covid-19 pandemic; and research developed by Murni Winarsih et al. (2022), with study material on the application of gamification in physics education. Based on the relevant research that has been clearly stated, it can be concluded that the author has the opportunity to develop a systematic review research in the field of physics education. As a result of technological developments, several applications have been found and they can assist in teaching physics, one of which is the use of Moodle in teaching physics (Sánchez et al., 2023).

## Method

### Searching Articles

This research is a systematic review, with a focal point on Moodle physics e-learning. This research uses article sources from the SINTA database. The first thing the researcher did was to synthesize each article, then the researcher classified the SINTA journal level used in this article from SINTA 5 to SINTA 1. This article contains journal sources that meet the publication criteria in 2013-2023 and are related to the use of Moodle in learning and in scientific trainings. The SINTA database was used as a source for the author in searching for articles, namely with the keywords of using Moodle and learning physics. From the five SINTA journals, 149 articles were obtained with details of the number of articles shown in Figure 1.

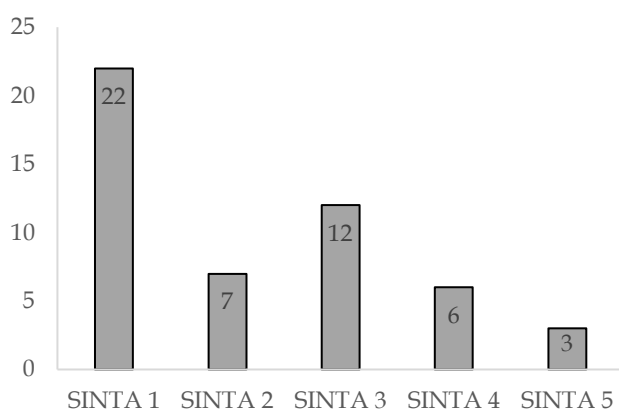


Figure 1. Distribution article source

The article systematic review model used is the PRISMA model (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) based on several criteria determined by the author. The articles reviewed must have the following criteria. 1) The studies in the article are from SINTA 5 to SINTA 1 database. 2) The research must be relevant to the use of Moodle in teaching or used in scientific trainings that utilize the Moodle web. 3) The articles were published as journal articles published between 2013 and 2023. The article selection process used in the article review can be seen in Figure 2.

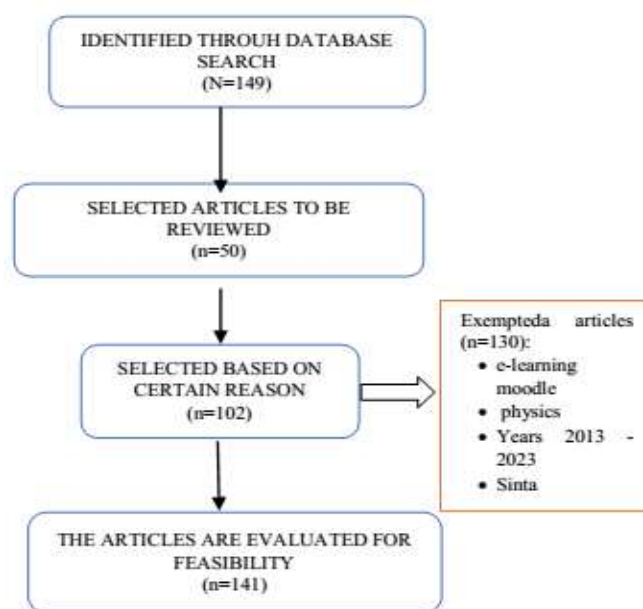


Figure 2. Process of article selection

In the article selection process, a total of 141 articles were selected. Of the 141 articles that were selected, there were 50 articles that met the criteria for analyzing the completeness of their contents.

### Data Analysis

The data from the journal review of this article were analyzed with several indicators. The indicators used are SINTA quartiles, year, university, author, keywords, research sample, findings, type of research, and research data analysis used in each article.

### Research Procedure

This research began with the formulation of research concepts such as selecting variables, determining research objectives, research criteria, and other material matters that become the review of article reviews. After obtaining a mature research study concept, the next step was to look for scientific articles from several predetermined sources. As many as 149 articles were collected and sorted using predetermined

criteria which were used as a reference. The result of sorting the 141 articles was 50 articles in accordance with the established criteria and the research topic. The next stage was reviewing the articles, and then analyzing the data. The result of the data analysis was used to draw a conclusion to answer the research objectives that had been formulated in the study. In general, the procedure of this study is shown in Figure 3.

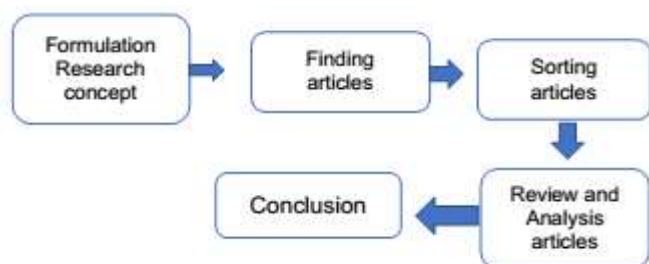


Figure 3. Research procedure

### Finding

The review analysis in this study was carried out manually by identifying and using data analysis software and then determining the keywords in reviewed articles using the Vosviewer software. The data on the year of research publication, the SINTA database, author, sample educational level, data analysis, and the type of research data were identified manually. The following is the distribution of data for the year the article was published shown in Figure 4.

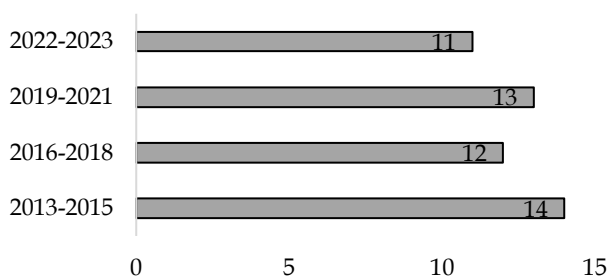


Figure 4. Distribution of publication year

In this study, 50 articles were the subject of the research review. The source of the journal articles reviewed was from 2013 to 2023. Fourteen articles were published from 2013 to 2015. The number of articles published in 2016 to 2018 was twelve articles. There were thirteen articles published in 2019 through 2021. From 2022 to 2023 there were eleven articles. Every year there must be a change in the number of articles published, but the most important thing is the SINTA database index and inclusion in physics teaching and utilization of Moodle.

## Result and Discussion

### Quartile and Year

SINTA, also known as Sinta Journal, stands for Science and Technology Index. It is an online scientific portal operated by the Ministry of Research and Technology and presents a list of accredited national journals. SINTA serves as a database or data center for accredited national journals. This makes Sinta the main destination for those looking for references in the form of national journals with quality recognized by the Ministry of Research and Technology (Bahri et al., 2021).

Journals included in Sinta are considered worthy of reference, frequently cited, and so on. Through this feature, Sinta can be used to show the strength of scientific publications from certain educational institutions or universities. In addition, Sinta has been directly connected to Scopus and Google Scholar to provide information about the international reputation of a journal. It is hoped that with features like these, anyone can more easily gain access to quality national journals (Salas-Rueda et al., 2023).

The journals analyzed in this article review are published in the SINTA database. The journals taken are publications from SINTA 1, SINTA 2, SINTA 3, SINTA 4, and SINTA 5. The articles reviewed come from several universities in Indonesia and universities abroad such as Chinese, the Middle East, Russia, Mexico, Spain, and Romania. From 2013 to 2016 there were several SINTA database articles, namely SINTA 1 database as many as eight articles, SINTA 2 as many as three articles, and SINTA 4 totaling three articles. Then from 2016 to 2018, there were six articles in the SINTA 1 database, two articles in SINTA 2, and four articles in SINTA 3. From 2019 to 2021 there were three articles reviewed with the SINTA 5 database, then two articles on SINTA 4, and eight articles on SINTA 1. Finally from 2022 to 2023, there were two articles reviewed with the SINTA 2 database and SINTA 3 for eight articles and one article from SINTA 4.

### Author Contribution Article

Indonesia is the country with the most universities in Southeast Asia. This can be illustrated by the large number of academic writers spread throughout Indonesia. Indonesia consists of the islands of Sulawesi, Java, Sumatra, Kalimantan, Nusa Tenggara, Papua, and Bali. Java Island contributes the most authors compared to other islands in Indonesia. In this article, the most authors are universities from Java, precisely in East Java, the two most contributing authors in this article are from West Nusa Tenggara, and finally the university with the least number of contributing authors is from East Nusa Tenggara. In addition to authors from universities in



Indonesia, this article also contains authors from universities outside the country, namely from universities in China, the Middle East, Russia, Romania, Mexico and Spain.

### Keyword

The keyword analysis was carried out to see the focus of attention of the research articles being reviewed. The analysis using Vosviewer obtained 189 keywords that show most research focuses on developing learning instruments that are oriented toward quantitative research types. This study developed Moodle-assisted media in physics teaching. Based on the results of the analysis presented in this article, it can be concluded that the popular research trend that is often used is the quantitative type with descriptive statistical tests. The result of the keyword analysis is shown in Figure 5.

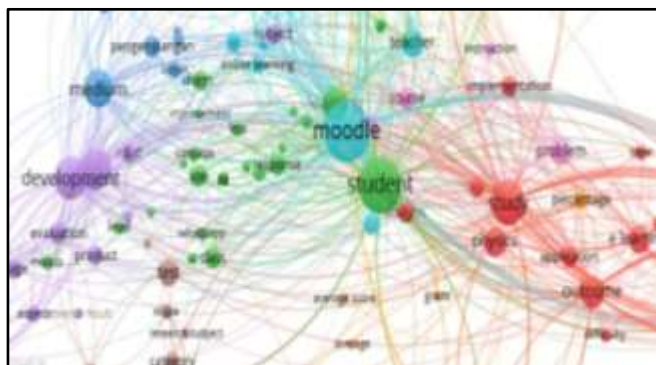


Figure 5. Keyword analysis of research design

### Research Type and Analysis Data

This study deals with three types of studies, namely qualitative, quantitative, and mixed-method studies. The research method is the method used by researchers in collecting research data (Anjani & Hasma, 2022). Quantitative research contributed very much, namely 42 articles, while mixed-method research contributed 8 articles. Quantitative research dominates because it only develops instructional media and then analyzes respondents with descriptive data analysis. Qualitative data are used for suggestions and criticisms as an indicator of strengthening the improvement of the developed learning media. Quantitative data are objective so the study with quantitative data aims to prove a theory. This quantitative study was analyzed using the T-test, N-gain, and statistical descriptive tests, while the qualitative data did not use statistical tests as indicators but in the form of in-depth reviews.

### Learning Moodle in Physics

Analysis of the development of physics teaching materials with the help of Moodle is more widely applied. Efforts to realize an effective, innovative, and fun learning process can activate students, so teachers

can utilize all available resources at school (Sarnou & Sarnou, 2021). Moodle LMS has an open-source platform so that the software's source code or basic code can be used and developed by users according to their needs (Matere et al., 2021). The use of Moodle can be implemented in classroom teaching. There are several articles linking the use of Moodle in physics teaching to improve critical thinking skills, independent learning, and scientific literacy.

### Conclusion

Moodle e-learning in physics teaching is very popular in analyzing data using descriptive statistical tests. Most of the authors in the article review domicile on the island of Java and the most contributing authors are from East Java. The type of research that is reviewed in this article is quantitative research, while qualitative research is not found in this article. The design of this type of quantitative research is research and development (R&D).

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### Author Contributions

This article contributed to the conceptualization of the research idea, methodology, formal analysis, design, investigation, data analysis, and conclusion were written and formulated by Muslimin B. while the software was analyzed by Diki Chen. Visualization and management responsibilities and coordination of research planning were carried out by Novita Eka Putri and Santri Adi Putri while the supervisors were Prof. Heru Kuswanto and Dr. Rida Situ Nur'aini Mahmudah.

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### Conflicts of Interest

The authors declare no conflicts of interest.

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