

Bibliometrik Research Trends on the Utilization of Learning Management System in Mathematics Learning on Google Scholar Using Vosviewer

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ABSTRACT

The use of LMS in learning is an option for educators because it can meet student learning needs without being tied to a place and can be used as a tool to assess student assignments recorded in e-learning. The purpose of this study is to analyze the development or publication trend of Learning Management System research published in SINTA indexed scientific journals, review citations, review trend analysis and keyword terms. This research was conducted using the bibliometric method. The research was conducted using data from scientific publications in 2015 – 2021. Journal articles related to the use of the Learning Management System in learning mathematics in a period of approximately 7 years experienced a significant increase. This is because learning that requires it to be done online and the use of LMS is considered important.

Keywords: e-learning, LMS, matematika, online

INTRODUCTION

The development of technology, information, and communication recently affects all aspects of life including the aspects of health, politics, security, and education (Setiyani et al., 2020). These developments are manifested in education field in Indonesia so that the teaching and learning process in schools and universities are required to be able to adapt to these conditions (Pamungkas et al., 2020). The use of e-learning during the Covid-19 pandemic is an alternative solution to make sure that the teaching and learning process continues, though it is done through online. Eventually, the use of 4.0 technology can be used as an online-based learning media (Pasaribu & Listiani, 2021).

This online learning system is a lesson that was carried out during the Covid 19 pandemic. Based on the policy taken by the Government of Indonesia, it was a

priority to keep the safety, and the health of teachers, students, families, and society in general (Suryani, 2021; Wajdi et al., 2020). Teachers are needed to ensure that the student learning activities and the teacher's teaching activity can continue even when students are at home. According to (Lisnani & Tanujaya, 2021) a policy from UNESCO in the field of education announced on 4th March 2020, is that learning can be done remotely or PJJ by utilizing the educational platform used by schools so that teachers can supervise learning of their students (Dewi & Wajdi, 2021). Another solution that can be done by teachers is to design learning media as an innovation by utilizing online media posted on the Learning Management System (LMS) to support the learning process (Pamungkas et al., 2020).

According to (Putra et al., 2020) Learning Management System or also called Virtual Learning Environment (VLE) is a system that has functions to provide learning materials, support collaboration, evaluate student scores, record students' data, and obtain reports on student learning outcomes. Which serves to measure the ability and effectiveness of student achievement in learning. Furthermore (Panjaitan & Octariani, 2021) explained the notion of Learning Management System (LMS) or VLE, is a software that can be used for the learning process and manage the results of learning activities. There are examples of available LMS, including Google Classroom, Schoology, Edmodo, Moodle, Quipper School, Learnboost, and many more (Rusdina & Pratiwi, 2021)

The use of LMS in learning is an option for educators as it can meet the student's learning needs without being tied to a place and can be used as a tool to assess student assignments recorded in e-learning (Fitriani, 2020). An online learning system known as e-learning is a learning process that requires learning aids to achieve active learning (K Sara et al., 2020). This tool is in the form of using LMS (Learning Management System) in the online learning process. Additionally, LMS made it easier for students to access learning materials from anywhere and anytime (Alifiyanti et al., 2019). As a digital learning media, LMS has a virtual classroom feature that provide distance teaching and learning processes. LMS also has a video conferencing feature that can be used by students for face-to-face meeting with teachers to study in real time. One feature that is widely used is the Google Classroom along with its video conferencing feature, Google Meet.

According to (Umairah & Zulfah, 2020) Google Classroom is an application created by Google that aims to help teachers and students when both are unable to attend the classroom directly. Students and teachers can arrange lesson schedules without having to be bound by learning time and places in class. In addition, the teacher also gives assignments to be assessed directly. Based on the research results from (Hartatik et al., 2021) it is stated that Google Classroom made it easier for students to find information related to learning, manage assignments given by the teacher and check assignments before they are submitted. The result of this research was that the use of Google Classroom in learning Mathematics was very effective for

class XII students at SMA Veteran 1 Sukoharjo. In addition, according to (Kristina Sara et al., 2020) in research on the use of Moodle as a Learning Management System in the Covid 19 learning process, the use of Moodle-based e-learning was very appropriate, because it could replace conventional teaching and learning activities due to the Covid pandemic. The availability and readiness of infrastructure is needed so that learning achievement can be implemented as expected.

Research related to LMS on Google Classroom and Moodle in the Mathematics learning process had been carried out many times. The needs to process the data that can be used for various purposes such as identifying other studies are still rarely carried out. According to Alan Pritchard (1960) in (Suharso et al., 2021) bibliometric research is a statistical and mathematical method of researching reviews of articles to find information as well as cataloging and classifying keywords, abstract titles obtained from scientific publications. Furthermore, bibliometric research according to (Widyaningsih et al., 2021) can be used to inform metadata about research from research that has been carried out or has been carried out and to find out opportunities for research in the future.

It is emphasized that bibliometric research on Learning Management Systems in mathematics learning is rarely done. Therefore, this study was conducted to determine the trend of the development of articles related to Learning Management Systems in learning mathematics by using the Google Scholar database during the period of 2015 to 2021. The purpose of this study was to analyze the development or publication trend of the Learning Management System research conducted. Published in SINTA indexed scientific journals, reviewing citations, reviewing trend analysis and keyword terms.

METHOD

This research was conducted using the bibliometric method. The research was conducted using data from scientific publications in 2015 – 2021. The total research containing articles on the Learning Management System journal in Mathematics learning using the Google Scholar database amounted to 321 papers as of November 11, 2021. The research sampling technique used the total sampling method. The variables studied included the Title of Publication, Keyword, Author, Journal Published, Year of Publication, Affiliation, and Publisher (Madjido et al., 2019).

According to (Nawang Sari et al., 2020) bibliometric analysis is a method that can be used to examine and identify publications of scientific research. The bibliographic method is used for metadata, analyzing data related to the journal article Learning Management System in learning mathematics. The metadata of this article uses the Publish or Perish (PoP) application and the data is visualized using the VOSviewer application.

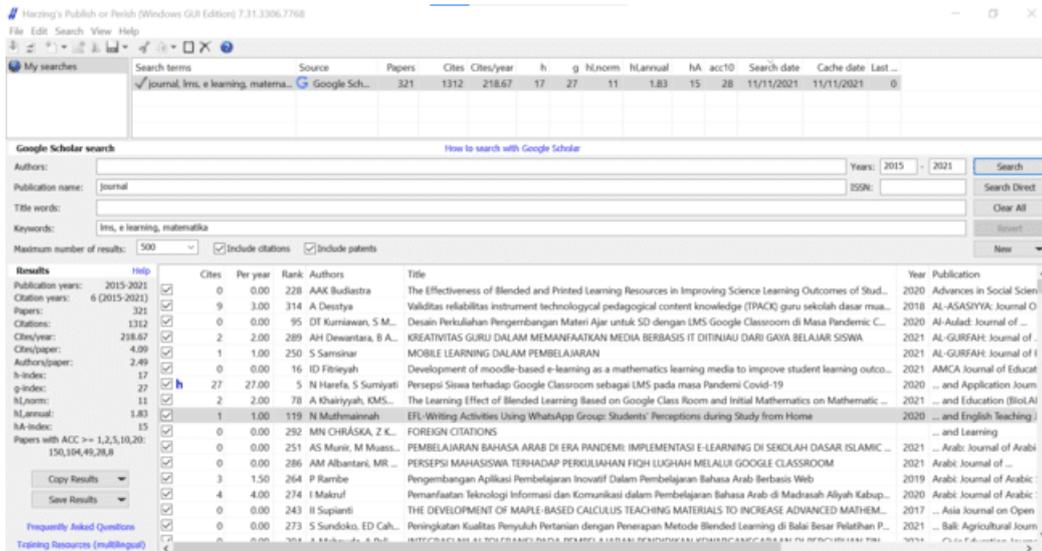
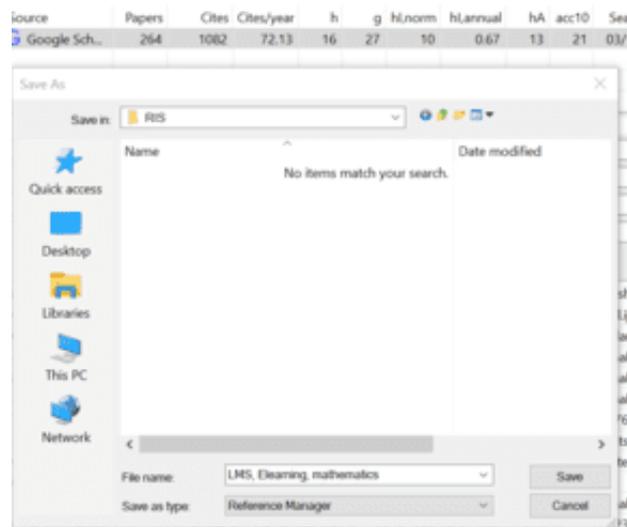


Figure 1 Pop Metadata search

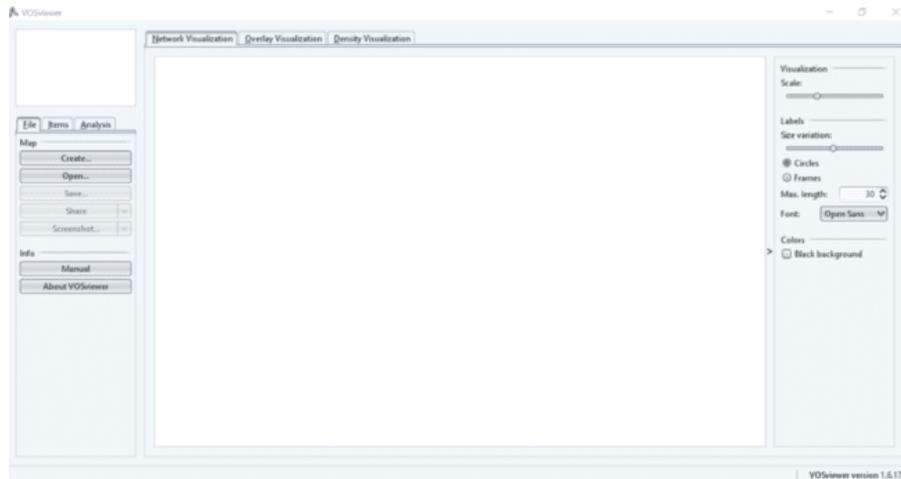
Picture 1 above was the first step in metadata search through Pop (Publish or Perish) from the Google Scholar database by writing the Publication Name in the Journal and the keywords used are 'LMS (Learning Management System)', 'Mathematics', and 'e-learning'. After that the search results data will appear and then the data was sorted based on the journals indexed by SINTA and SCOPUS. The results were saved in RIS format which later processed in the VOSviewer application and Microsoft Excel.



Pict 2. Saving the data in RIS Format

Picture 2 showed how the metadata results were stored in the RIS format in the Publish or Perish (PoP) application. According to (Al Husaeni & Nandiyanto, 2021) Publish or Perish can be used to find out the names of the most cited authors, the oldest and most recent years of journal articles and information from all related research on Learning Management Systems. The processed data were journals from

scientific publications related to the Learning Management System then re-analyzed using the Microsoft Excel application and visualized using the VosViewer application.



Pict 3. VosViewer Display

RESULTS AND DISCUSSION

The results of the metadata and related data analysis about the Learning Management System in the mathematics learning process from year to year can be observed in table 1. Based on table 1, information was obtained that the highest number of publications of journal articles related to the use of the Learning Management System occurred in 2021. 2019-2021 there was a fluctuate increase due to the Covid 19 pandemic condition that hit the world so most of the learning was carried out online and utilizing the Learning Management System in the learning process and transfer of knowledge.

Table 1. Growth of Article Published about Learning Management System in Math Learning

Year	Researchers	Precentage
2015	2	1,18
2016	1	0,59
2017	0	0,00
2018	8	4,73
2019	36	21,30
2020	54	31,95
2021	68	40,24

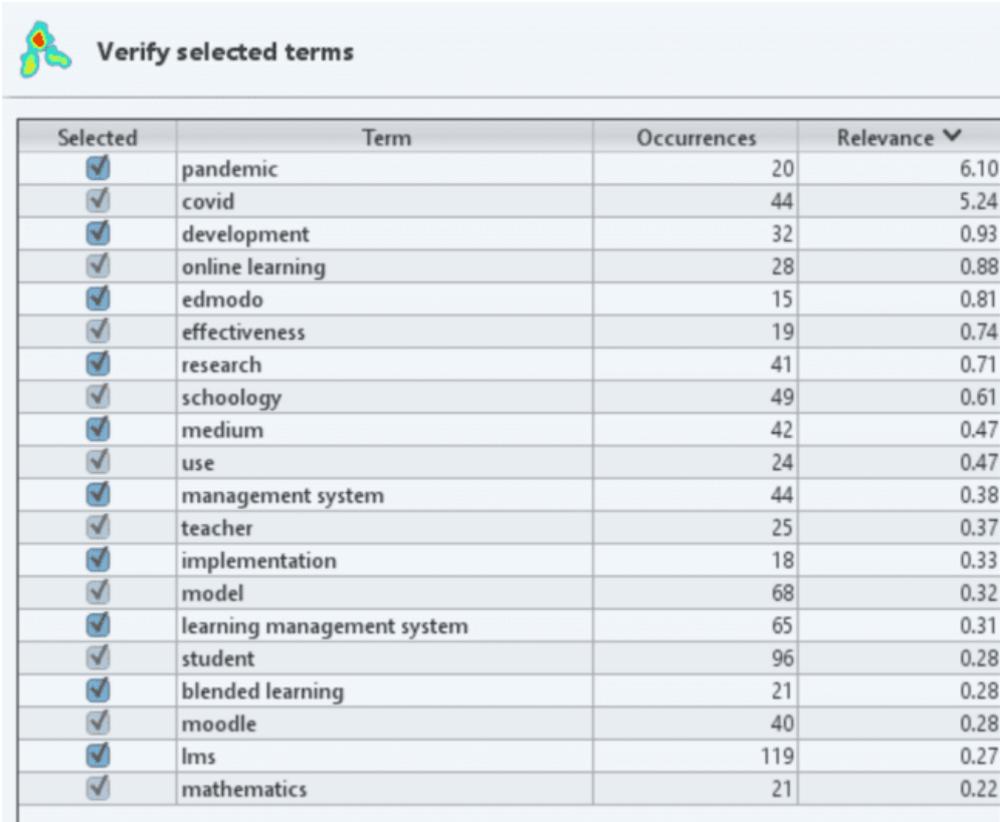
In table 1, data analysis has been carried out based on the names of journals indexed by SINTA and SCOPUS. The sorting results obtained were 169 journals from 321 journals available at the beginning. Based on the results in table 1, we can conclude that the number of research has increased, this proves that the interest of researchers in the use of the Learning Management System in learning mathematics has increased. From 169 journals, the results of the analysis in the database show the top 21 journals that publish research results related to LMS as presented in table 2 below:

Table 2. Most Productive Journal Published Articles Related to Learning Management System

Journal Type / Name	Number of Publication
Journal of Physics: Conference Series	54
Unnes Journal of Mathematics Education	14
European Journal of Educational Research	13
Journal for the Education of Gifted Young Scientists	11
Journal of Education Technolog	4
Arabi: Journal of Arabic Studies	3
Indonesian Journal of Educational Studies	3
International Journal of Elementary Education	3
Journal of Medives : Journal of Mathematics Education IKIP Veteran	3
Pi: Mathematics Education Journal	3
Britain International of Linguistics, Arts and Education (BIoLAE) Journal	2
Generation Journal	2
Innovative Journal of Curriculum and Educational Technology	2
Indonesian Journal of Science and Mathematics Education	2
International Journal of Instruction	2
JOHME: Journal of Holistic Mathematics Education	2
Journal for Lesson and Learning Studies	2
Journal of Environmental and Science Education	2
Journal of Primary Education	2
JURNAL MathEdu (Mathematic Education Journal)	2
SJME (Supremum Journal of Mathematics Education)	2

Based on table 2, of the 21 journals that published, the most productive related to Learning Management Systems were the Journal of Physics: Conference Series, with 54 publications (31.95%), followed by the Unnes Journal of Mathematics Education with 14 publications (8.28%), European Journal of Educational Research with 13 publications (7.69%), Journal for the Education of Gifted Young Scientists with 11 publications (6.51%), Journal of Education Technologist with 4 publications (2.37%), Arabi: Journal of Arabic Studies, Indonesian Journal of Educational Studies, International Journal of Elementary Education, Journal of Medives : Journal of Mathematics Education IKIP Veterans, Pi: Mathematics Education Journal each with 3 publications (1.78%) the remaining 2 publications (1,18%).

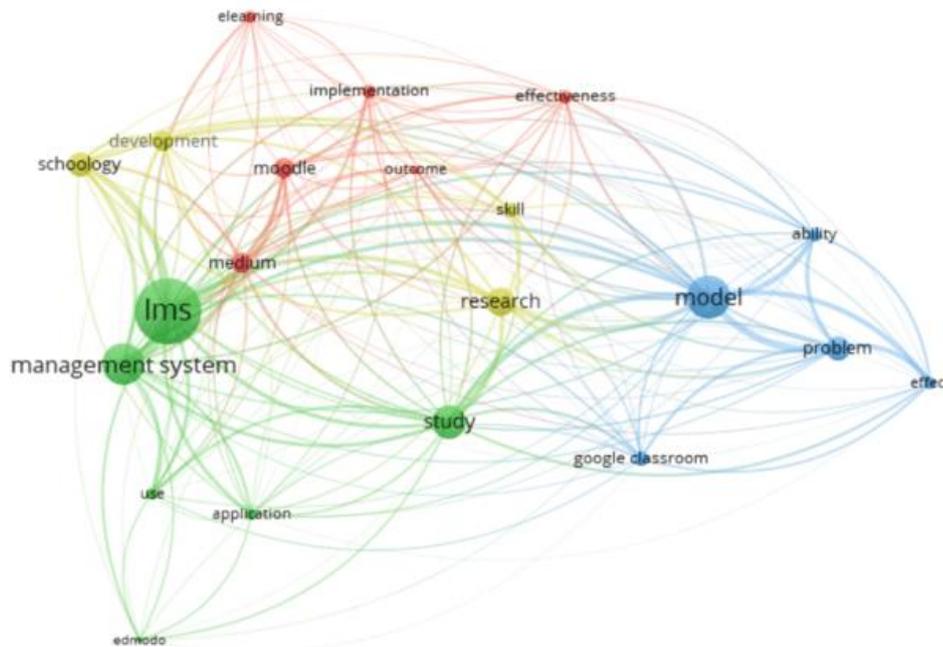
Based on the results of research using keywords in Publish or Perish (PoP), it showed that research trends related to Learning Management Systems with the LMS keyword appeared the most followed by students, models, learning management systems and Schoology. More details can be seen in table 3, Learning Management System research trends based on title and abstract → full counting method → Occurance 11 → detected 30 that meet the criteria



Selected	Term	Occurrences	Relevance ▼
<input checked="" type="checkbox"/>	pandemic	20	6.10
<input checked="" type="checkbox"/>	covid	44	5.24
<input checked="" type="checkbox"/>	development	32	0.93
<input checked="" type="checkbox"/>	online learning	28	0.88
<input checked="" type="checkbox"/>	edmodo	15	0.81
<input checked="" type="checkbox"/>	effectiveness	19	0.74
<input checked="" type="checkbox"/>	research	41	0.71
<input checked="" type="checkbox"/>	schoology	49	0.61
<input checked="" type="checkbox"/>	medium	42	0.47
<input checked="" type="checkbox"/>	use	24	0.47
<input checked="" type="checkbox"/>	management system	44	0.38
<input checked="" type="checkbox"/>	teacher	25	0.37
<input checked="" type="checkbox"/>	implementation	18	0.33
<input checked="" type="checkbox"/>	model	68	0.32
<input checked="" type="checkbox"/>	learning management system	65	0.31
<input checked="" type="checkbox"/>	student	96	0.28
<input checked="" type="checkbox"/>	blended learning	21	0.28
<input checked="" type="checkbox"/>	moodle	40	0.28
<input checked="" type="checkbox"/>	lms	119	0.27
<input checked="" type="checkbox"/>	mathematics	21	0.22

Pict 4. Visualized Results of Analysis Data Based on the Title and Abstract on Vosviewer

The data above was the results of data analysis through the VOSviewer keyword trend application from a research document that refers to the abstract and title of an article to produce 30 terms that were the most relevant and are repeated at least 11 terms. Based on the data analysis, the results of the visualization of repetition of words in the title and abstract can be described as follows:

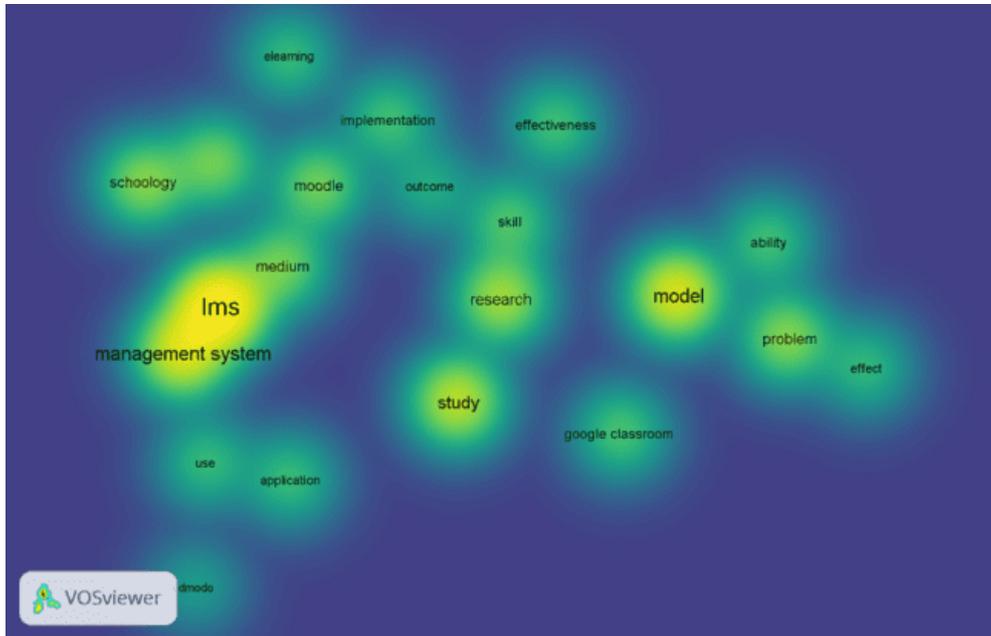


Pict 5. Visualized Network Based on Keyword

Based on the results of the analysis of terms or keywords in the article on the use of the Learning Management System in the mathematics learning process, the popular ones used in the Learning Management System article are, "LMS", "management system", and "model". These metadata were intended to find information on what researchers had been doing for the last 7 years or so. The most common research trend was the red cluster. The following are the details of the keywords from the 4 clusters based on data analysis using the VOSviewer application, namely:

1. Cluster one (red colored) consists of 6 keywords, namely: effectiveness, e-learning, implementation, medium, moodle, and outcome. The keyword that often appears in cluster one was 'Moodle'.
2. Cluster two (green colored) consists of 6 keywords, namely: application, Edmodo, LMS, management system, study, and use. The keyword that often appears in cluster two was 'LMS'.
3. Cluster three (blue colored) consists of 5 keywords, namely: ability, effect, google classroom, model, and problem. The keyword that often appears was 'Model'.

4. Cluster four (yellow colored) consists of 4 keywords, namely: development, research, schoology, and skills. The keyword that often appears was 'research'.



Picture 6. 'LMS' Research Theme Density

The results of Picture 6 showed a map of the density that occurred between terms or keywords used in Learning Management System research. The density of the terms was shown in bold yellow, which meant that many had researched the keyword 'Learning Management System'. This meant that the lighter the color density, the more research was carried out. One of the keywords or themes that can be researched is Edmodo where the colors displayed are dim colored.

Edmodo is an application that is connected to the internet that can assist in the teaching and learning process as well as being a means of information (Amalina et al., 2019). Furthermore, according to (Mubarak & Nura, 2021) Edmodo is a social networking application in the learning process by utilizing LMS. Edmodo has many facilities that can be enjoyed by both teachers and students including a safe place to communicate with each other, share learning content, student assignments, tests, virtual discussions, and assessments.

We can conclude that the keywords that are rarely used related to the use of the Learning Management System in the mathematics learning process are 'Edmodo', outcome, and effect. These three keywords can be references in researching further in the future. This means that the topic of Edmodo, outcomes, and effects is still not widely studied for its trends. This proves that there is an opportunity to do research with these keywords or topics.

CONCLUSION

Based on the results of research that has been carried out, it can be concluded that journal articles related to the use of Learning Management Systems in learning mathematics in a period of approximately 7 years behind have experienced significant increase. This was because learning that requires to be done online and the use of LMS is considered important. From the data obtained, the most publications articles were in 2019-2021. The name of the journal that publishes the most related to the use of the Learning Management System in mathematics learning is the Journal of Physics: Conference Series, which was 54 publications (31.95%). The results of trend analysis showed that Edmodo, effect, and outcome are keywords that are rarely researched. These three keywords can be used for reference material related to future research.

Based on the research conducted, the authors suggest conducting further studies on the use of LMS in different databases such as using SCOPUS or similar apps to obtain more relevant data to be researched on an ongoing basis.

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