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TRENDS IN EDUCATIONAL RESEARCH ABOUT LEARNING MANAGEMENT SYSTEM AS CONTRIBUTIONS IN PRIMARY SCIENCE LEARNING: A SYSTEMATIC LITERATURE REVIEW (2015-2024)

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Abstract: A Learning Management System (LMS) is a platform or system designed to help manage, administer and deliver learning in an educational environment. This research aims to identify and analyze LMS research trends in their contribution to elementary school science learning in the era of revolution 4.0. This research method is descriptive and analytical. The data used in this research was obtained from documents indexed by Google Scholar from 2015-2024 using Publish or Perish and Dimension.ai. Research procedures use PRISMA guidelines. The data identified and analyzed included types of publications, publication sources, and titles of LMS research that were widely cited. The data analysis method uses bibliometric analysis assisted by VOSviewer software. The results of the study show that the LMS research trend indexed by Google Scholar from 2015 to 2024 has experienced a fluctuating increase. The most significant increase was from 2020 to 2022, then decreased in 2023. There are many documents, such as articles, proceedings, monographs, preprints, and edited books, that discuss LMS research. Keywords that are often used in LMS research are the COVID-19 pandemic, Moodle, blended learning, distance learning, Edmodo, Canvas, and others.

Keywords: learning management system, primary science learning, industrial revolution 4.0

***Abstrak**: Learning Management System (LMS) merupakan sebuah platform atau sistem yang dirancang untuk membantu pengelolaan, administrasi, dan pengiriman pembelajaran dalam lingkungan pendidikan. Penelitian ini bertujuan untuk mengidentifikasi dan menganalisis tren penelitian LMS kontribusinya dalam pembelajaran IPA SD di era revolusi 4.0. Metode penelitian ini bersifat deskriptif dan analitik. Data yang digunakan dalam penelitian ini diperoleh dari dokumen yang terindeks Google Scholar dari tahun 2015-2024 menggunakan Publish or Perish dan Dimension.ai. Prosedur penelitian menggunakan pedoman PRISMA. Data yang diidentifikasi dan dianalisis berupa jenis publikasi, sumber publikasi, dan judul penelitian LMS yang banyak disitasi. Metode analisis data menggunakan analisis bibliometrik yang dibantu software VOSviewer. Hasil analisis menunjukkan bahwa trend penelitian LMS yang terindeks Google Scholar tahun 2015 hingga 2024 mengalami peningkatan yang fluktatif. Peningkatan paling besar yaitu pada tahun 2020 hingga 2022, kemudian menurun pada Tahun 2023. Terdapat banyak dokument baik berupa artikel, proceeding, monograph, preprint, maupun edited book yang membahas tentang penelitian LMS. Kata kunci yang sering digunakan dalam penelitian LMS adalah pandemic covid-19, moodle, blended learning, distance learning, edmodo, canvas, dan lainnya.*

***Kata Kunci:** learning management system, pendidikan sains sd, revolusi industry 4.0*

INTRODUCTION

Industrial Revolution 4.0 has brought significant changes in various aspects of life, including the world of education. In the educational context, the Industrial Revolution 4.0 creates new opportunities and challenges (Alaloul et al., 2020; Xu et al., 2018). Education now has a greater focus on developing digital skills. Students are taught about digital literacy, online ethics,

cybersecurity, and the use of digital tools for communication and learning. Technological changes in the world of work have driven the importance of continuing education and skills development throughout life. Individuals must be ready to adapt to rapid career changes (Ghobakhloo, 2020).

Industrial Revolution 4.0 has triggered the development of online-based education. Schools and colleges now offer online courses and distance degrees, allowing students to study from anywhere with internet access (Shahroom & Hussin, 2018). The use of digital technology, such as computers, mobile devices, and online platforms, has changed the way teaching and learning are done (Hussin, 2018; Penprase, 2018). Schools and colleges are increasingly adopting online learning software and platforms to provide access to a broader range of educational resources (Taufik, 2020). Students need to get used to using digital tools and applications to explore science concepts. One of them is the use of a LMS (Oke & Fernandes, 2020).

LMS is a platform or software designed to provide, manage and support online or distance learning (Aldiab et al., 2019). LMS allows educational institutions, companies, or organizations to manage the entire learning process, including content provision, student interaction, assignment management, and reporting (Oguguo et al., 2021; Turnbull et al., 2020). LMS provides tools for creating, distributing, and grading tests, assignments, and quizzes. Assessment results can be accessed by teachers and students. LMS includes communication and collaboration features, such as discussion forums, chats, or online discussion rooms, that enable interaction between teachers and students as well as between fellow students (Findik-Coşkunçay et al., 2018).

LMS provides reporting tools that allow teachers or administrators to view student progress, participation, and achievement data (Balkaya & Akkucuk, 2021). This analysis can help identify areas that need improvement. LMS has become an essential component in the modern educational environment, both in formal educational institutions and in business environments for employee training. Its existence allows learning to be more flexible, scalable, and accessible to a large number of participants from various locations (Alturki & Aldraiweesh, 2021). LMS can be used to create learning trajectories that can be adjusted according to student needs. Students can follow the learning modules independently or according to the teaching plan effectively (Ashrafi et al., 2022; Awad et al., 2019).

Science learning with LMS is a practical approach to integrating technology in teaching and learning (Saputro & Susilowati, 2019). With an LMS, students can access materials and assignments anytime and anywhere. This allows for more flexible self-directed learning. Apart from that, LMS will enable teachers to easily update learning materials along with developments in science and technology (Setiawan et al., 2021; Bahtiar & Ibrahim, 2022). The use of LMS in science learning can provide a more interactive, collaborative and adaptive learning experience. It also allows teachers to better track student progress and provide more targeted feedback (Ramdani et al., 2021; Shazali et al., 2023).

Based on the description above, it is necessary to carry out a literature review to determine LMS research trends in their contribution to elementary school science learning in the era of revolution 4.0. It is hoped that this research can become a reference in developing research related to LMS in elementary school science learning.

METHOD

The research method used in this research is descriptive and analytical, which aims to determine LMS research trends in their contribution to elementary school science learning in the era of revolution 4.0. Apart from that, this method also provides insight into the development and evolution of ethnopedagogical-based educational practices in science learning in elementary schools. The data used in this study was obtained from information sources indexed by Google Scholar using analytical tools such as Publish or Perish and Dimension.ai. To carry out a search on Google Scholar, keywords related to LMS research trends in science learning in the Industrial Revolution 4.0 era are used.

In this research, an analysis was carried out on 1,000 documents that had been indexed by Google Scholar between 2015 and 2024. The reason for choosing Google Scholar as a document

search source is because Google Scholar applies consistent standards in selecting documents to be included in its index and also because Google Scholar has more documents than any other primary database, especially in the context of research in education and social sciences. To filter data that has been collected via Publish or Perish, researchers used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

RESULT AND DISCUSSION

This research aims to analyze LMS research trends in their contribution to elementary school science learning in the era of revolution 4.0. The research document on LMS research trends in its contribution to elementary school science learning in the 4.0 revolution era is taken from documents from 2015 to 2024. Figure 1 presents LMS research trends in its contribution to elementary school science learning in the 4.0 revolution era.

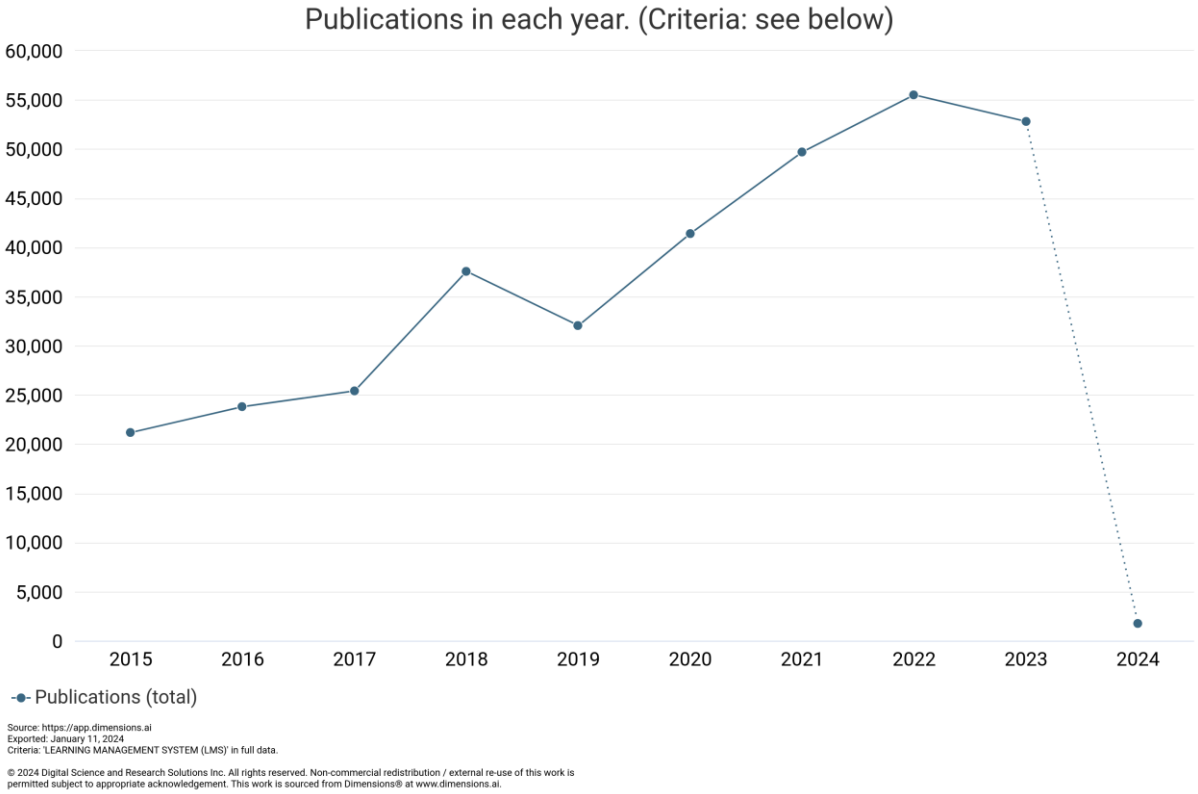

Figure 1. LMS Research Trends in Science Learning

Figure 1 shows that the LMS research trend from 2015 to 2024 has increased. Where the LMS research trend from 2019 to 2022 has increased. However, in 2023, the LMS research trend will decline. The increasing trend in LMS research was due to the Covid-19 pandemic in 2019. This causes learning to be done online.

The use of LMS in online learning from 2019 to 2023 will experience significant development in response to changes in education and technology. Since 2019, the use of LMS has become increasingly popular at various levels of education, including elementary and tertiary education. Schools and universities are starting to adopt LMS platforms to support online learning. As time goes by, LMSs are increasingly updated with more advanced technology (Kraleva et al., 2019; Sharifov & Mustafa, 2018). This includes the integration of artificial intelligence (AI) for adaptive learning optimization and more advanced data analysis (Zabolotniaia et al., 2020).

During this period, the use of mobile devices in online learning also grew rapidly. Many LMS have optimized their platforms for mobile devices, allowing easier access for students using smartphones or tablets (Miah et al., 2020). The use of LMS in online learning from 2019 to 2023

reflects a significant transformation in the way education is delivered and accessed. This also emphasizes the importance of adaptation and innovation in the ever-changing world of education (Aldahwan & Alsaeed, 2020). Below, we also present trends in ethnopedagogical research based on the type of publication.

Table 1. Trend LMS Research Based on Publication Types

Publication Type	Publications
Article	304,726
Chapter	150,091
Edited Book	54,282
Monograph	22,817
Proceeding	20,490
Preprint	17,740

Based on Table 1, it is known that ethnopedagogical research from 2015 to 2024 is contained in 6 types of publications. LMS research trends in the form of articles are 304,726 documents, in the form of chapters are 150,091 documents, edited books are 54,282 documents, monographs are 22,817 documents, proceedings are 20,490 documents, and preprints are 17,740 documents.

LMS research trends in the form of articles are the type of publication that contains the most research on LMS compared to other kinds of publications. Meanwhile, the kind of publication that includes the least amount of LMS research results is a preprint. Research conducted by Yanwar (2020) states that an article is a piece of writing that contains information, news, opinion, research, or exposition about a specific topic. Articles are often found in various media, such as newspapers, magazines, scientific journals, news websites, and blogs. The primary purpose of an article is to convey information to readers or provide a particular point of view on a topic.

Meanwhile, a preprint is an initial version of a research paper or scientific report that is shared online before going through a formal peer review process by a scientific journal or conference. Preprints are documents containing the latest findings and research that have not been verified or approved by the scientific community through a peer review process (Fraser et al., 2021). The top ten (10) sources of ethnopedagogical research trends are presented below.

Table 2. Top 10 Sources Title Trend LMS Research in 2015-2024

Name	Publications	Citations	Citations Mean
Lecture Notes in Computer Science	2,460	11,146	4.53
Communications in Computer and Information Science	1,020	2,472	2.42
Education and Information Technologies	882	17,521	19.87
Lecture Notes in Networks and Systems	812	1,426	1.76
Advances in Intelligent Systems and Computing	784	3,519	27.96
Advances in Social Science, Education and Humanities Research	735	608	0.83
SSRN Electronic Journal	680	995	1.46
arXiv	669	63	0.09
International Journal of Emerging Technologies in Learning (iJET)	620	5,843	9.42
Sustainability	595	10,600	17.82

Table 2 shows that the most widely published sources of ethnopedagogical research trends are Advances in Social Science, Education and Humanities Research, namely 11 publications with three citations and an average citation of 0.27. The proceedings series Advances in Social Science, Education and Humanities Research aims to publish proceedings from conferences on the theories and methods in the fields of social sciences, education and humanities. All proceedings in this series are open access, i.e. the articles published in them are immediately and permanently free to read, download, copy & distribute. Each volume is published under the CC BY-NC 4.0 user license, which defines the permitted 3rd-party reuse of its articles. The online publication of each proceedings is sponsored by the conference organizers, and hence, no additional publication fees are required (Kulczycki et al., 2018). Below are also presented ten (10) top trends in LMS research, which are widely cited by other researchers who are related to this matter.

Table 3. Top 10 Citation on Trend LMS Research in 2015-2024

Cites/year	Year	Author	Title
40.57	2017	FH Wang	An exploration of online behaviour engagement and achievement in the flipped classroom supported by a learning management system
40.33	2021	U Alturki, A Aldraiweesh	Application of Learning Management System (LMS) during the covid-19 pandemic: A sustainable acceptance model of the expansion technology approach
38.88	2016	I Han, WS Shin	The use of a mobile learning management system and academic achievement of online students
36.67	2021	MK Mohammadi, AA Mohibbi, MH Hedayati	Investigating the challenges and factors influencing the use of the learning management system during the Covid-19 pandemic in Afghanistan
35.50	2020	NHS Simanullang, J Rajagukguk	Learning Management System (LMS) based on moodle to improve students learning activity
28.56	2015	A Horvat, M Dobrota, M Krsmanovic...	Student perception of Moodle learning management system: a satisfaction and significance analysis
27.33	2018	K Holmes, E Prieto-Rodriguez	Student and staff perceptions of a learning management system for blended learning in teacher education
27.00	2023	AIM Elfeky, MYH Elbyaly	The use of data analytics techniques in learning management systems to develop fashion design skills and technology acceptance
26.67	2021	BCE Oguguo, FA Nannim, JJ Agah…	Effect of learning management system on Student's performance in educational measurement and evaluation
0.43	2017	DB McKay, BJ Young	Engagement of ESL Students with a Science Course Delivered in English with an Emphasis on Assessment Using a Learning Management System

Table 3 shows that the LMS research that is widely cited by other researchers is about "An exploration of online behavior engagement and achievement in flipped classroom supported by learning management system" with 40.57 citations per year (Wang, 2017). Then the research entitled "Application of learning management system (LMS) during the Covid-19 pandemic: A

sustainable acceptance model of the expansion technology approach" received 40.33 citations per year (Alturki & Aldraiweesh, 2021). This data is comparable to data on the increasing trend of LMS research from 2015 to 2024. This means that in that year, research related to LMS was continuously cited by other researchers.

In the articles researched and written by these researchers, there are many terms/keywords related to ethnopedagogy. Below are ten (10) popular keywords associated with LMS.

Table 4. Keyword on Trend Ethnopedagogy Research in 2015-2024

Terms	Occurrences	Relevance
LMS	939	2.44
Pandemic	42	2.38
Edmodo	13	2.22
Learning management system	750	2.08
Covid	69	1.82
Moodle LMS	20	1.40
Learning activity	17	1.21
Canvas	15	0.98
Blended learning	10	0.94
Distance learning	11	0.85

Table 4 shows that the keyword that frequently appears related to LMS research is LMS 939 times with a prevalence of 2.44. LMS is a concept that is increasingly gaining attention in research trends in the field of education (Altinpulluk & Kesim, 2021). LMS helps research in understanding how technology impacts learning. LMS designed and used to manage, deliver and support online learning or distance learning (Kraleva et al., 2019). LMS allows users to create, organize, and share learning content, such as course materials, assignments, reading materials, videos, and exams (Bradley, 2021). The LMS can manage users, including student registration, access rights management, and user profile creation (Morze et al., 2021).

Table 4 also shows that the Covid-19 pandemic is also a keyword that appears frequently in LMS research trends, namely 42 times with a relevance of 2.38 and 69 with a relevance of 1.82. LMS research trends during the COVID-19 pandemic have become a very relevant topic in the world of education. During the COVID-19 pandemic, LMS use has significantly increased at various levels of education, from elementary school to college. LMS is the primary tool for delivering learning material and managing distance learning.

LMS use during the COVID-19 pandemic has become an important research topic in the field of education. The pandemic has exposed technological challenges that need to be overcome, especially in environments where access to devices and internet connections is limited (Rahiem, 2020). This has driven efforts to provide better access to technology for all students. The COVID-19 pandemic has accelerated the shift to distance and hybrid learning. LMS is a crucial tool in delivering distance education, and LMS research helps us identify ways to improve it.

This visualization is accomplished by generating a landscape map, which offers a visual representation of subjects related to scientific studies. The outcomes of bibliometric mapping for the co-word network on articles pertaining to the topic of LMS are illustrated in Figure 2.

Figure 2 shows the results of bibliometric keyword mapping on LMS research trends. In Figure 2, there are 22 keyword items that are frequently used in LMS research from 2015 to 2024. There are 114 links and the total link strength is 166. This image also contains 6 clusters, where the first cluster is colored red, which consists of 8-word items. The keys are access, assessment, canvas, learning management system, LMS, new learning management system, and school. The second cluster in green consists of 4 keyword items, namely: classroom, development, edmodo, and learning activity. The third cluster in blue consists of 3 keyword items, namely blended learning, Moodle LMS, and role. The fourth yellow cluster consists of 3 keyword items, namely case, distance learning, and integration. The fifth purple cluster consists of 3 keyword items, namely covid-19,

lms, and pandemic. The sixth cluster, which is colored light blue, consists of 1 keyword item, namely outcome. The results of the cicles network visualization analysis show the same thing as the results of the study carried out by (Golino et al., 2020), where there are six clusters in the trend analysis of other research as well.

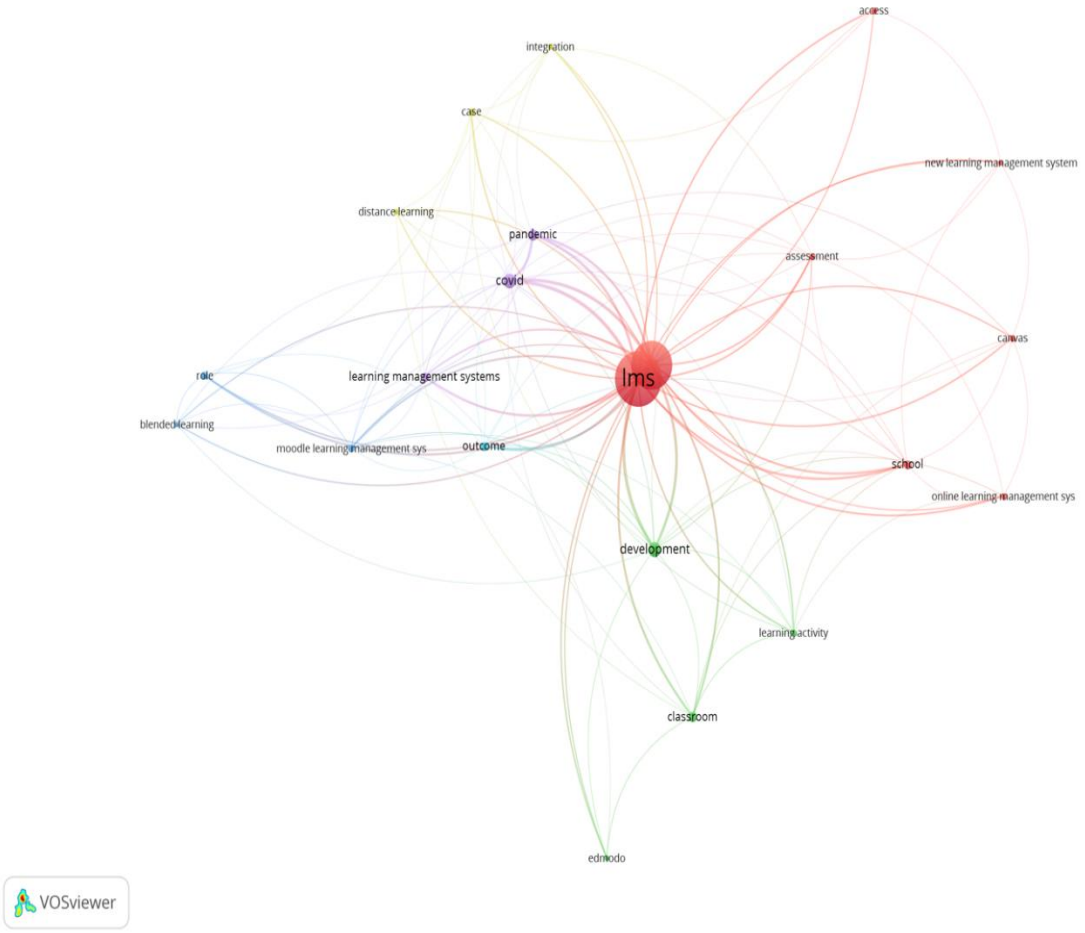

Figure 2. Network Visualization on Trend LMS Research

Figure 2 above also shows that network visualization shows the network between the terms being visualized. Keywords classified into six clusters are arranged in a color chart showing the divisions/clusters that are connected to each other. The results of this analysis can be used to determine keyword research trends in the last year. This analysis shows several keywords that are frequently used in LMS research. The more keywords that appear, the more comprehensive the visualization displayed. Below are also presented keywords about LMS based on overlay visualization.

Figure 3 shows the trend of keywords related to LMS research in Google Scholar indexed journals from 2015 to 2024. The trend of themes for writing articles related to LMS from the oldest to the newest year is marked by the themes of blue, turquoise, dark green, light green and yellow. In the image above, you can see that the keywords Covid-19 pandemic, development, and Moodle LMS are yellow clusters. This shows that these keywords were widely used by researchers in 2020 to 2021. In 2019, the keywords that often appeared were learning activity, assessment, classroom. The following is also presented regarding LMS research keywords based on density visualization.

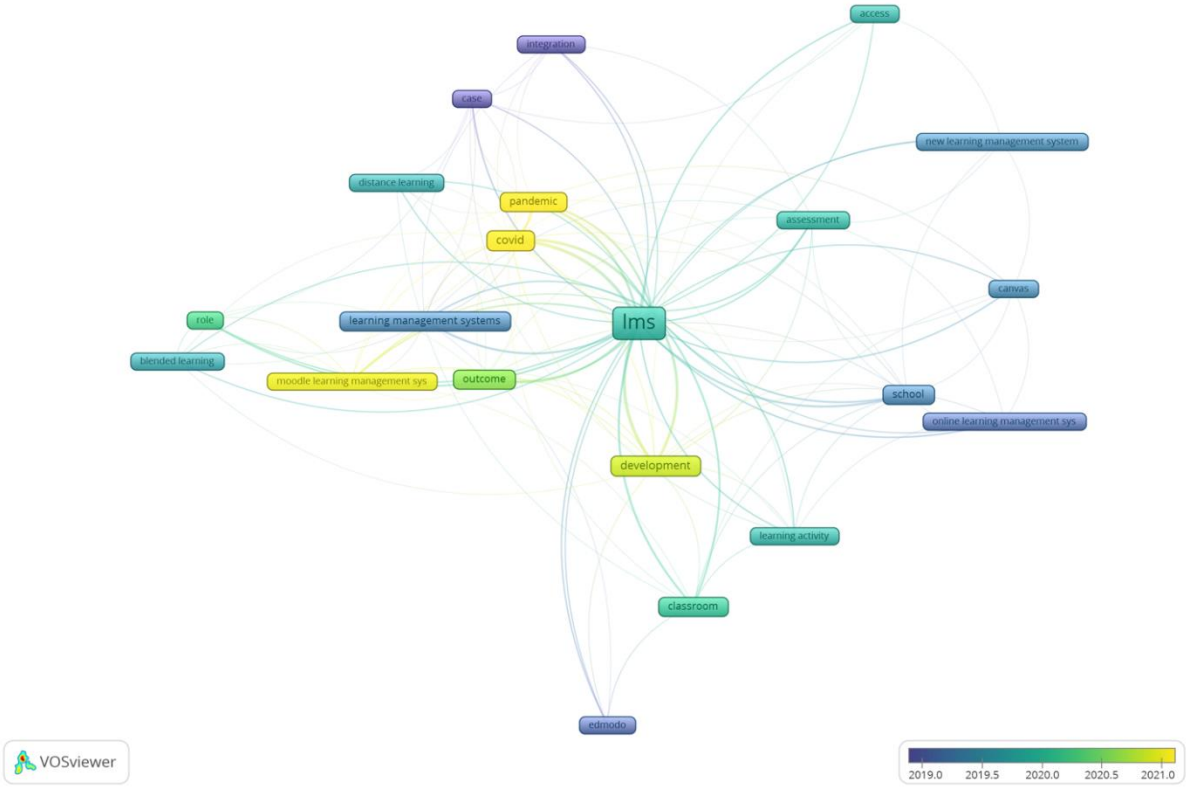

Figure 3. Overlay Visualization on Trend LMS Research

Figure 4 shows density visualization. The density of research themes is shown in bright yellow. The more colorful the colors of a theme, the more research is done. The fainter the color means the theme is rarely researched. Themes that are faintly colored such as new lms, and integration are keywords that are faintly colored. This shows that these keywords can be used as a reference for further research. He et al., (2022), Doyan et al., (2023) and Bahtiar et al., (2023) stated that yellow indicates keywords that are currently and frequently used in research.

Based on Figure 4, it is also known that. This ethnopedagogical research trend helps schools and teachers respond to the diversity of students' cultures and backgrounds. This can create a learning environment that is inclusive and supports all students. In addition, this research trend also opens the door for further research and the development of more effective learning strategies. This can encourage the development of better curricula and teaching methods. The development of ethnopedagogy in educational research helps understand how education can become more inclusive, relevant, and student-oriented (Aeni, 2019). This research trend reflects the importance of understanding and appreciating cultural differences in modern education.

Research on LMS has high urgency in the world of education era of revolution 4.0. Currently, distance learning is getting more and more attention, especially along with technological developments. LMSs are one of the primary tools used in distance learning, and research can help understand how using LMSs can improve the quality and accessibility of distance learning. In diverse learning environments, LMS provides much-needed flexibility to students. This can help students with varying schedules and learning needs. In addition, the use of an LMS can help increase educational accessibility for those who may have physical or geographic barriers to attending school conventionally.

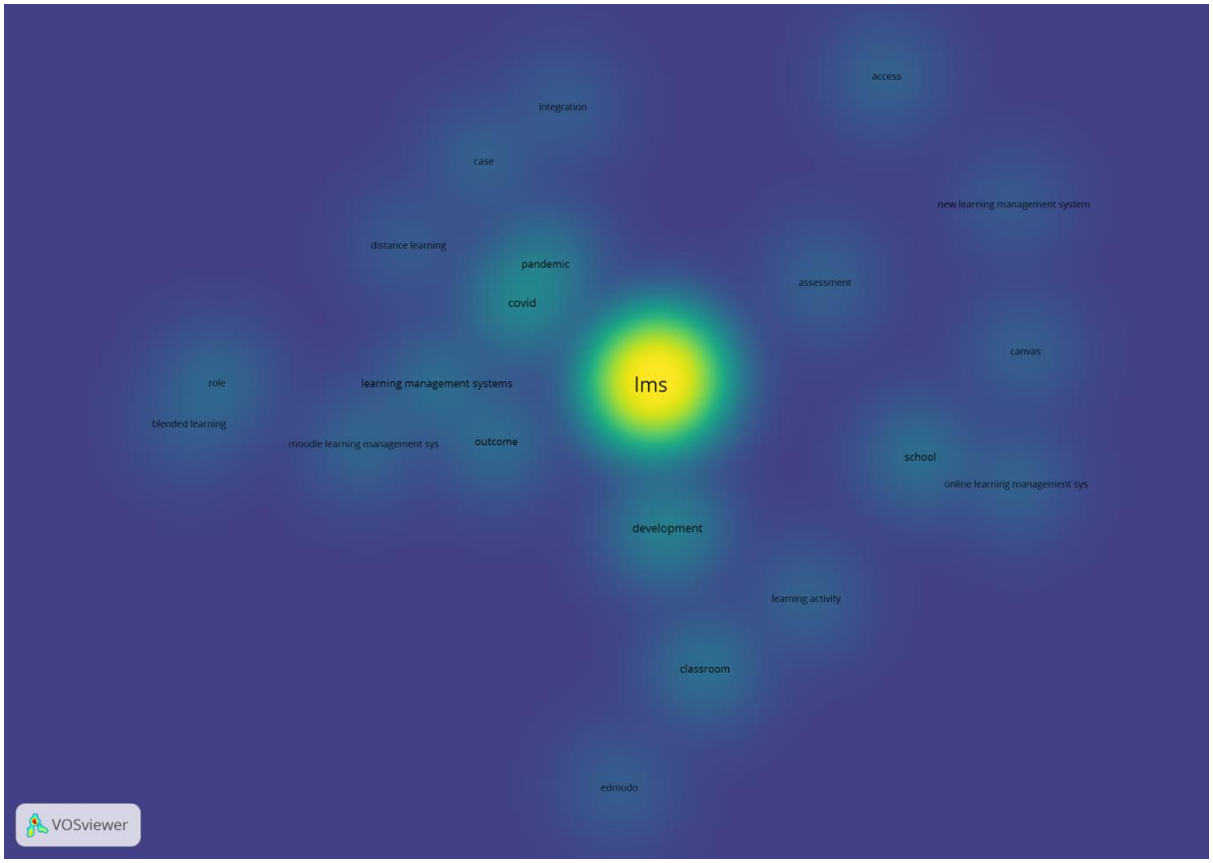

Figure 4. Density Visualization on Trend LMS Research

The ability to operate with technology such as an LMS is becoming increasingly important in an increasingly digital world of work. Research can help students and educators prepare for increasingly connected work environments. An LMS can help reduce costs associated with producing and distributing physical learning materials. Research can assess the economic impact of LMS use in educational institutions. LMSs continue to evolve, and research on LMSs can help drive innovation in instructional design, content development, and the use of technology in learning.

Given this urgency, research on LMSs can provide valuable insight into how technology can impact education and how best to leverage it. This will help improve the quality of teaching and create a more inclusive and efficient learning environment

CONCLUSION

Research on LMS trends in their contribution to science learning in elementary schools has high urgency because Technology is becoming increasingly important in the world of education. LMS research helps us understand how this technology can be used effectively to support science learning, which is a fundamental subject. The COVID-19 pandemic has accelerated the shift to distance learning. LMS research at the elementary to tertiary level helps us find the best way to teach science online to students. The LMS research trend indexed by Google Scholar from 2015 to 2024 has experienced a fluctuating increase. The most significant increase was from 2020 to 2022, then decreased in 2023. There are many documents in the form of articles, proceedings, monographs, preprints and edited books that discuss LMS research. Keywords that are often used in LMS research are Covid-19 pandemic, Moodle, blended learning, distance learning, Edmodo, Canvas, and others.

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