



Adoption Of New Trends On Teaching And Learning Is Lms-Moodle:A Bibliometric Analysis Between 2006 And 2022

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ABSTRACT

The current research paper aims to provide such a comprehensive outlook using the Bibliometrics method in the period between 2006 to 2022 of Web of Science dataset.The review used the 4-step PRISMA process to identify 64 suitable articles out of 521 from 84 journals in 35 countries were determined through bibliometric analysis with Vosviewer outputs and thematic analysis.This review shows that Moodle is mainly used within University STEM disciplines and effectively improves student performance, satisfaction, and engagement. Moodle is increasingly being used as a platform for adaptive and collaborative learning and used to improve online assessments.This study recommended More qualitative research is required on the use of Moodle, particularly investigating educators' perspectives and also Further studies need to incorporate educational theories when designing courses using the Moodle platform.

keywords:New trends of teaching and learning, LMS-MOODLE, Bibliometric analysis.

INTRODUCTION

The notion of e-learning commonly implies carrying out and realization of an educational process based on information and communication technologies. This means that, while grasping knowledge as a way of interaction between a student, content, teacher, technology should be included as well, given that, besides technology, the importance of quality learning and teaching should not be neglected(Dimić, et al.,2018).E-learning is based on the use of electronic devices in a learning process. In thepast, this meant the use of analogue devices, whereas today mostly digital devicesare learned, among which particularly important are computers and mobile devicesconnected to the Internet (Bognar,et al.,2016).

Essentially, LMS refers to a range of programs or systems that offer online educational services to educators, learners and administrators.The platform administers online learning resources on a wide range of instructional subjects. Among these, these, the Modular Object Oriented Dynamic Learning Environment(MOODLE), More number of users as of 2020, is one of the most prominent open-source LMS platforms worldwide.During the COVID-19 pandemic , over one billion students in 129 countries worldwide were affected(Rice,2006).In response to the COVID-19 out break, many universities worldwide switched to Emergency Remote Teaching (ERT) via online platforms. This was a shift from the conventional approach to online and blended learning approaches.Consequently, this led to the rise in the adoption of Moodle across several learning institutions worldwide.As a result, the effectiveness of Moodle and students' learning outcomes and engagement have become a matter of concern for teaching and learning institutions in our society.

Nowadays, oneof the most commonlyused is Modular Object Oriented Developmental Learning Environment(Moodle), a free learning management system enablingthe creation of powerful, flexible and engaging online courses andexperiences (W. H. Rice,2006). Previous researchers did make an effort to study the circumstance of Moodle adaption in teaching and learning in worldwide nations from different disciplines and perspectives.The current research paper aims to provide such a comprehensive outlook using the Bibliometrics method. Pritchard first introduced the term "Bibliometric" in 1969, and Hawkins (2001) explained it as "the quantitative analysis of the bibliographic features of a body of literature.

Background of the study

Learning Management System

A Learning Management System is a web-based software application that is designed to handle learning content, student interaction, assessment tools and reports of learning progress and student activities. Learning content that is online is accessed through an LMS, which allows students to see and interact with learning tools via web browsers using any operating system, computer or mobile devices. Learning Management Systems are also platforms that include learning systems, course management systems, content management systems, portals, and instructional management systems.

LMS can also help students to access learning information via course guidelines, uploading assignments and downloading marks, active interactions between students and lecturers, interactions between students, interactions between students and learning tools, sharing knowledge, and taking online exams and quizzes (Kasim, & Khalid, 2016).

MOODLE (Modular Object Oriented Dynamic Learning Environment)

It is open source software that can be freely downloaded from the web. It was developed in 2001 and is based on the social constructionist pedagogical principle. It is developed under the terms of a GNU General Public License (GPL), which means that any changes can be made to the source code as long as the original license is not changed.

The characteristics of the Moodle platform are user-friendliness, accessibility, and flexibility. There is an on-line Moodle community with over 200,000 registered users of the host site moodle.org. It is easily used and internationally accessible. It allows the educator to develop a course with multiple functions, including file hosting, quizzes, assignments, chats, discussion forums, glossaries and questionnaires. It is similar to the commercially produced VLE blackboard.com (Lovatt, 2007).

The Moodle platform was user friendly, had many interactive features that could enhance the students' learning experience, and allowed more flexibility in teaching. The introduction of Moodle also improved student performance in their final year exams, suggesting that it had a positive impact on student learning outcomes (Kasim, & Khalid, 2016).

Research Questions

This research aims to answer the questions

Q1: What are the overall publications across countries, years, citations and journals of the literature Moodle in teaching and learning?

Q2: Who are the most influential authors, and what are the most citation papers of Moodle in teaching and learning?

Q3: Which one is most influential keywords interlinked with Moodle?

Q4: Which type of learning methods adoption by Moodle for teaching and learning?

Methodology

This study used bibliometric methods to investigate research on LMS Moodle adoption in teaching and learning. Moreover, It has been widely adopted in education research in the past (Mustafa and Ali, 2023; Gamage, et al., 2022). This paper presents our process of constructing the database, refining the database, and collecting information from the database.

Identification of Sources

The literature search was carried in the Web of Science dataset. In terms of data coverage, Web of Science accommodates authors' data in cited references, which makes it better for co-citation and author-based citation analysis (Zupic & Cater, 2015).

Another advantage of Web of Science is that its data on the educational field of study is notably more comprehensive than Scopus (Hallinger & Kovačević, 2019). In terms of convenience, many bibliometrics software packages support extracting data from Web of Science (Zupic & Cater, 2015; Pham, et al., 2022b). For the above reasons, Scopus was our optimal choice.

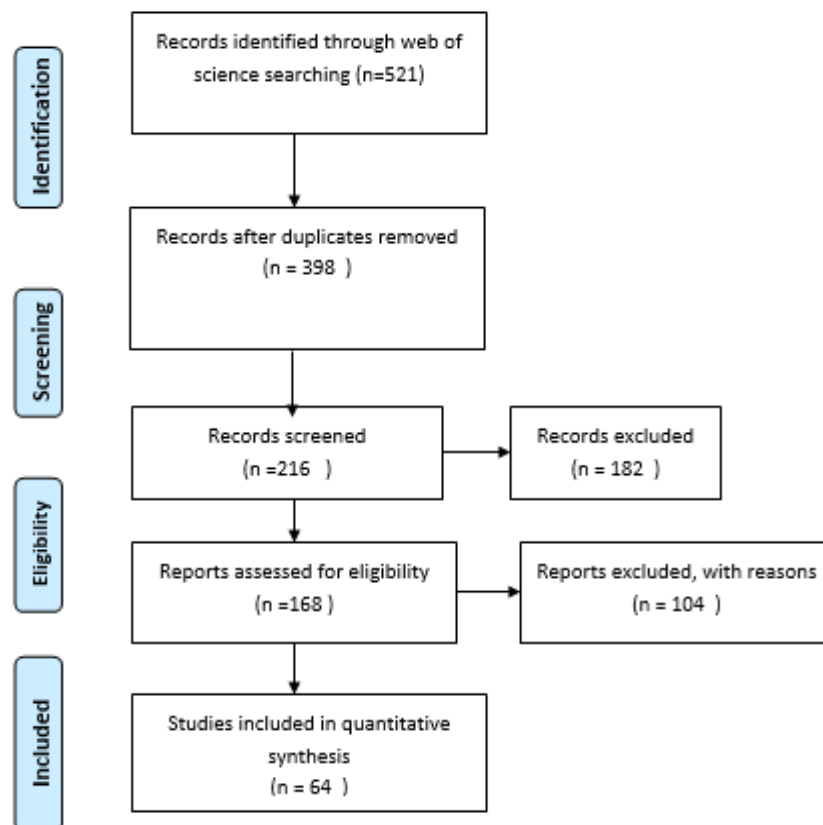


Fig:1The PRISMA Diagram Demonstrating data collection process of Moodle from theWeb of science Database

Data collection

This study followed the guidelines suggested by the referred Report specific terms for meta analysis (PRISMA) guidelines and combined with an author-concept approach to categorize the literature according to its relevance to the topics of the study. The process was carried out in five phases: 1) searching the literature in Scopus databases according to relevant keywords;2) screening the selected literature;3) Applying the inclusion/exclusion criteria;4) categorizing and analysing the literature and 5) communicating the findings(Gamage, et al, 2022). The Scopus database were collected and reviewed in 2006 and updated in may 2023. The main keywords were the TITLE-ABS-KEY Moodle, Online Learning, e-learning and students that find any records that include Moodle in any form across title ,abstract or keywords.This shows the following PRISMA diagram specifically for collection of records.

The database initially search and identified 521 Moodle related articles from web of science from the year 2006-202. This including journals, articles, conference proceedings, book chapters and papers published in English. This screening reduced the number of articles found to 398. The prescreened papers were retrieved from the relevant database and checked for duplication.After removing duplicates, the abstracts from the remaining 398 papers were examined, and excluded 182 papers. At the same time the remaining 216 papers and eliminated 14publications not diretly linked to this study. Some studies were ruled out because they were prospective studies with no empirical evidence, and the methodology was not well defined, or pilot studies. As a result,

Data Analysis

Bibliographic data of documents (including authors, title affiliations, citations, references, keywords, and abstracts) were stored in an Excel file.The advanced bibliometrics statistics(including co-occurrence, co-citation,co-countries)were performed by VOSviewerbibliometric software(Van ECK & Waltman,2017).

Bibliometric analysis

RQ:1What are the overall publications across countries, years, citations and journals of the literature Moodle in teaching and learning?

Publication across the countries

Vosviewer has the facility to produce a density map of co-occurrences in countries

Fig. shows the density map of countries publishing more than two articles fifty-five countries contributed research to the 154articles.The higher the count of publications, the brighter the yellow, with Spain

contributing 60 articles, China 16, Turkey 14, Australia & USA 12, Portugal 11, Brazil 8, Italy, Serbia 8, Romania, Germany & Finland 9 and Egypt, Greece & Oman 5 articles. The software positions the countries with a similar number of articles published close to each other. Therefore, Vosviewer provides the reader with an instantaneous pictorial result of countries publishing Moodle articles.

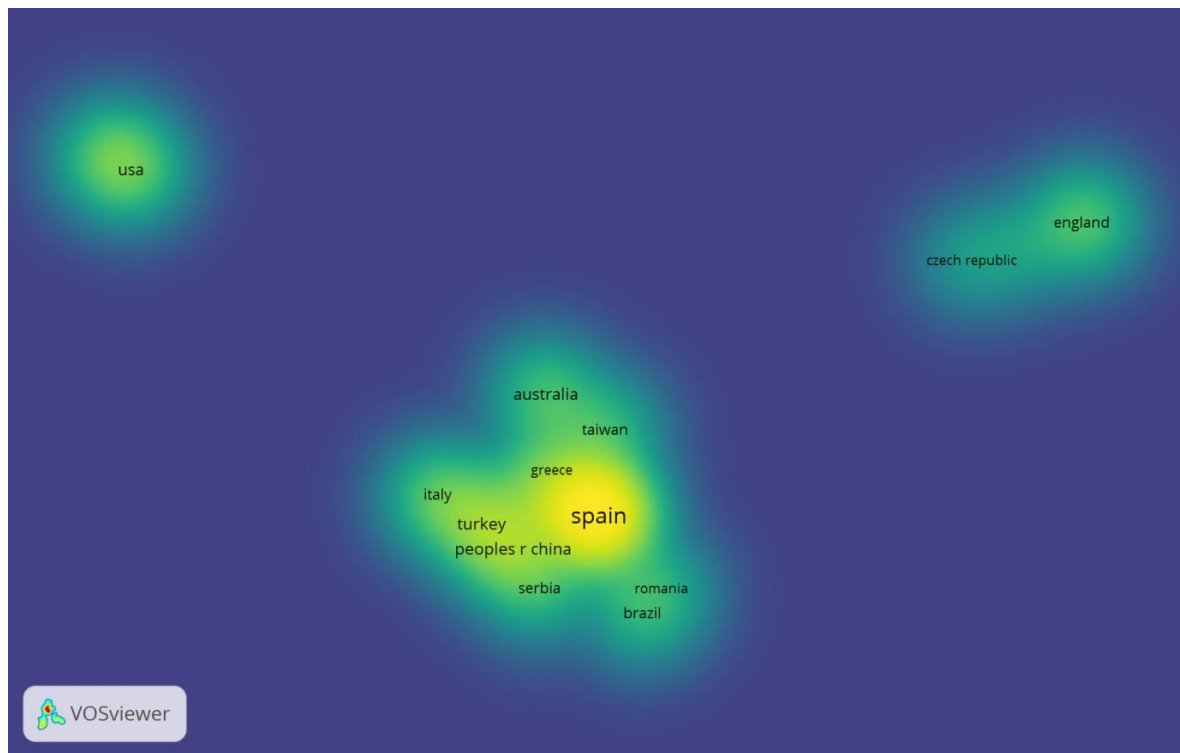


Fig.:2 Publications of LMS-Moodle articles across the countries in the year 2006-2022
Journal publications and citations

Firstly the expansion of the topic is examined across the period of year in Fig.3 Image of Scopus datasheet diagram illustrates the developing timeline of the literature with 2006 marking the earliest papers recorded in the Scopus database 2006 paper. The number of publications quickly reached the ten and above (16) in 2011 and then gradually increases citation moderately, except for a sudden drop in 2013 and 2014 publications. Moreover the exponential growth has been observed in recent years, More than half of the total Publications being produced in the 2016- 2021, meanwhile citations increases specifically in this period and the 2021-2022 was the peak year with 36 publications and citations. And also the diagram shows the less paper Publication till upto the May 2023 and also citations also decreases may be the reason of not completion of year 2023.

Table:1Number of Articles published in year 2006-2022

Publication Year	NO. of Articles Published
2022	36
2021	27
2020,2019	21
2015	20
2018,2016	17
2017,2012	15
2011	16
2014,2013	9
2010	8
2009,2023	6
2007	4
2008	3
2006	1

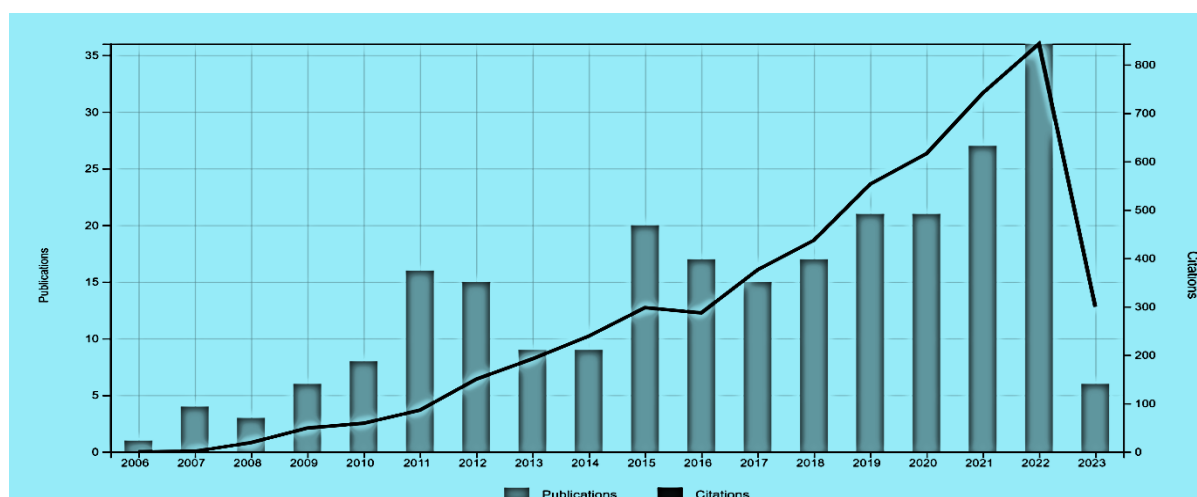


Fig:3 Image for year wise Journal Publication and Citations datasheet getting from Scopus Database-2023

RQ:2 Who are the most influential and cited authors, papers and Published journal name used with Moodle in teaching and learning?

Table: 2 Top Influential and citations authors and papers

Sl.No	Author's Name	Year	Title of the article	Number of citations
1	Burca-Voicu, et al.,	2022	Investigating Learners' Teaching Format Preferences during the COVID-19 Pandemic: An Empirical Investigation on an Emerging Market	127
2	Gamage, et al	2022	A systematic review on trends in using Moodle for teaching and learning	124
3	Asad& Malik	2023	Cybergogy paradigms for technology-infused learning in higher education 4.0: a critical analysis from global perspective	110
4	El Kharki, et al	2021	Design and Implementation of a Virtual Laboratory for Physics Subjects in Moroccan Universities	101
5	Ekici, M	2021	A systematic review of the use of gamification in flipped learning	101
6	Polat, et al	2022	Examining the effect of feedback type and gender on computing achievements, engagement, flipped learning readiness, and autonomous learning in online flipped classroom	97
7	Patael, et al	2022	Remote proctoring: Lessons learned from the COVID-19 pandemic effect on the large scale on-line assessment at Tel Aviv University	94
8	Ward, et al	2014	Effects of a Research-Infused Botanical Curriculum on Undergraduates' Content Knowledge, STEM Competencies, and Attitudes toward Plant Sciences	94
9	Romero,et al	2008	Data mining in course management systems: Moodle case study and tutorial	93
10	vanOostveen, et al	2019	Professional development learning environments (PDLEs) embedded in a collaborative online learning environment (COLE): Moving towards a new conception of online professional learning	93
11	Cerezo, et al	2016	Students' LMS interaction patterns and their relationship with achievement: A case study in higher education	92
12	Ho, et al	2021	Predicting student satisfaction of emergency remote learning in higher education during COVID-19 using machine learning techniques	89
13	Taskin, &Cakmak	2022	Effects of Gamification on Behavioral and Cognitive Engagement of Students in the Online Learning Environment	88

The most influential publications and are ranked based on their citation counts. As Presented in Table, the most cited article with 127 citations is “Investigating Learners' Teaching Format Preferences during the COVID-19 Pandemic: An Empirical Investigation on an Emerging Market” by Burca-Voicu, et al.,(2022). Furthermore, above 100 citation, were four authors Gamage,et al(2023), Asad& Malik,(2022), El Kharki, etal&Ekici,(2021)and above 90 citations six authors and two authors were cited 88 and above. Moreover the number of citations displayed, and is the accumulated citations of a paper in the whole Web of Science database.

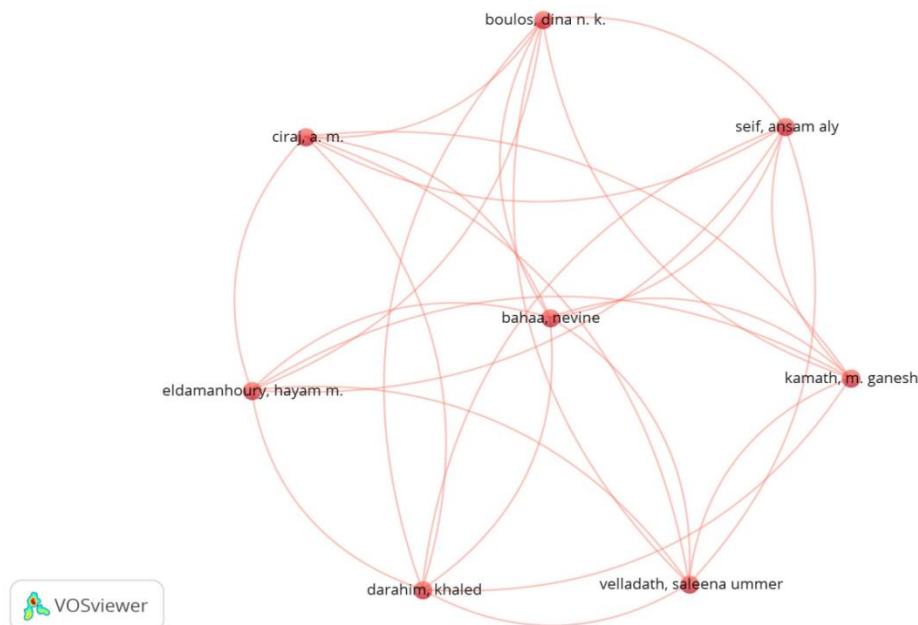


Fig:4Top Influential and citations authors connectivity diagramMost number ofarticles published journal name

Moodle is prevalent in various disciplines, as revealed by 164 journals relevant to this study. Journals titles that published three or more articles are shown in Fig.4. The journal with the most published Moodle related articles wasComputer Applications in Engineering Education(18 articles),followed by Computers Education (17 articles), and then Journal of Education and Information Technologies and sustainability(10 articles), IEEE Transaction on Education(8 articles), IEEE Access(7 articles),International Journal of Educational Technology in Higher Education and International Journal of Engineering Education(6 articles), and British Journal of Educational Technology(5 articles).

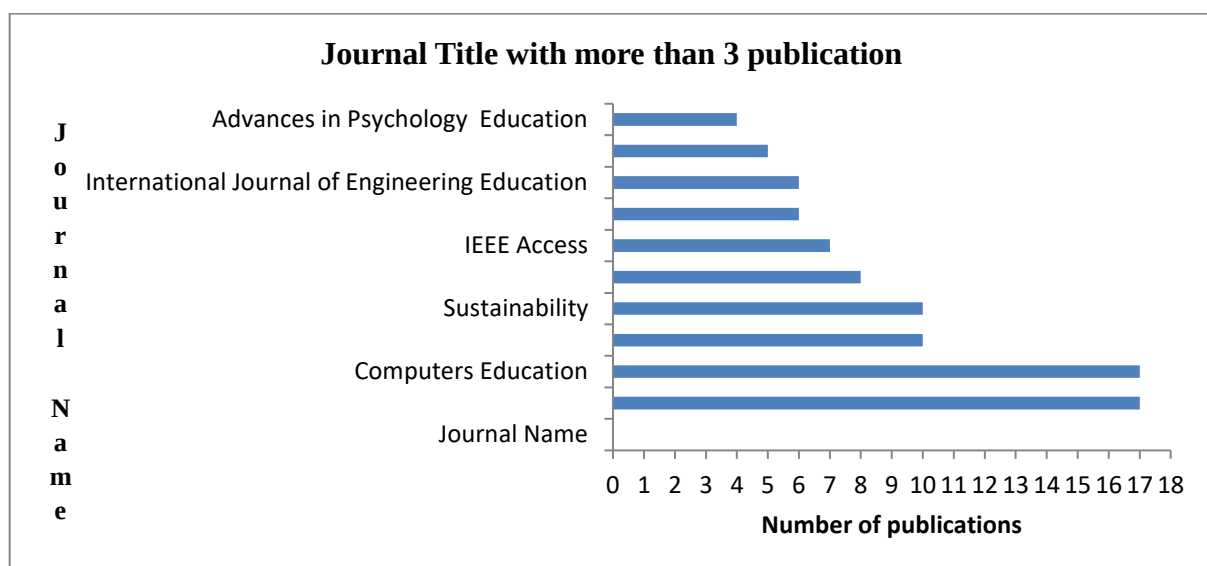


Fig.5 Journal titles that have published more than three articles used in this study

RQ:Which one is most influential keywords interlinked with Moodle?

Popular keywords

Over the years, the area of focus in the research community has always changed. To follow the emerging topics in the literature, we look at the author keywords co-occurrence overlay visualisation. The keywords from the 164 articles were analysed in Vosviewer. In total 736 ,of which 113 were used three times or more. Table shows the top 10 keywords . The most occurring keyword was Moodle 64, followed by Education(42), Student Performance(38), Learning Management Education and Higher Education(28) and e-learning(25).

Table:3Top 10 Popular keywords

Sl.No	Key words	Number of times used
1.	Moodle	64
2.	Education	42
3.	Student Performance	38
4.	Learning Management System(LMS)	28
5.	Higher Education	28
6.	E-learning	25
7.	Teaching	24
8.	Flipped classroom	19
9.	Distance learning	18
10.	Assessment	18

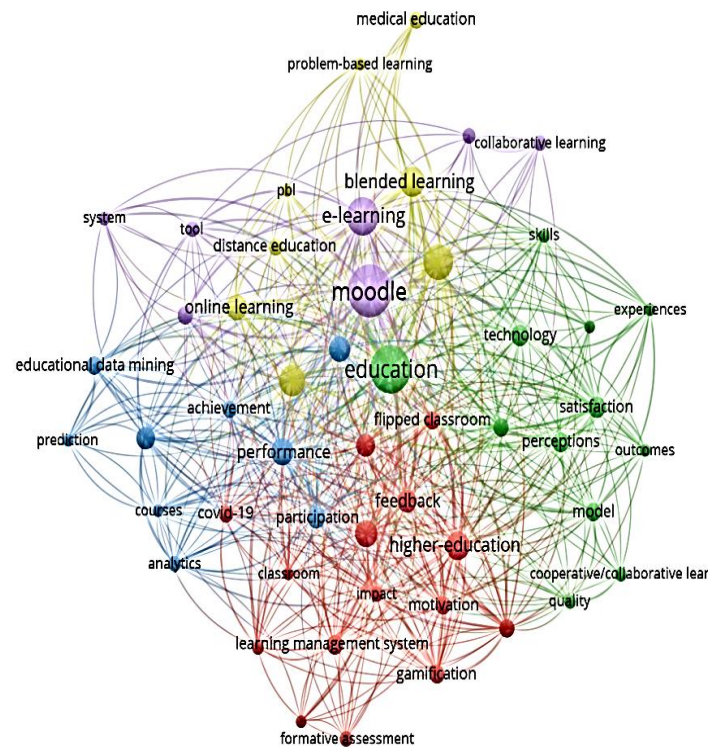
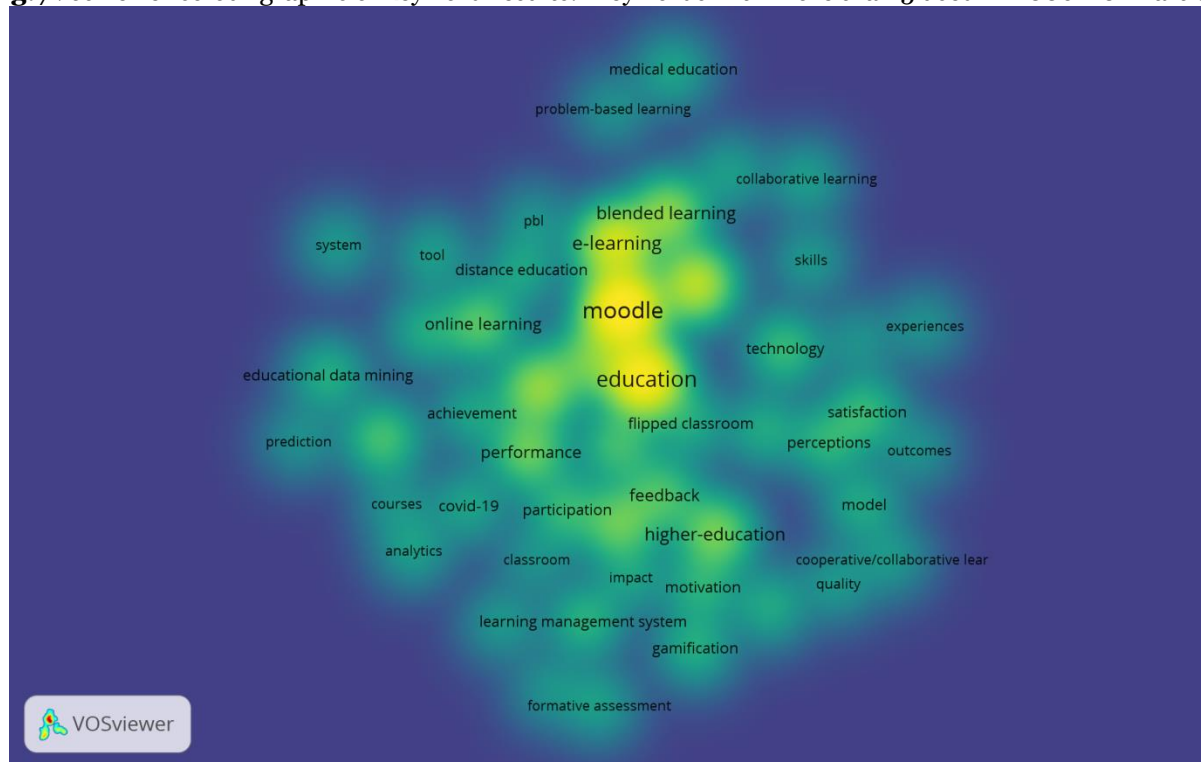


Fig:6Vosviewer cluster graphic of keyword results: Keywords with more than 5 used in 2006-2022 articles

Along with the ability to extract the top keywords used within the articles, Vosviewer produced cluster graphics of keywords.

Figure 5 shows the cluster graphic of keywords of more than five uses or a higher density with a larger marker on the graphic; hence, the most significant markers are Moodle, e-Learning, and Education. The map also has the feature to zoom in and out, showing more keywords and highlighting the most occurring keywords associated with Education in the 164 articles (with more than 50 occurrences) can be seen with linked keywords, such as Moodle, Student, and e-Learning. All keywords can be highlighted individually for associations to be seen. (Gamage, et al., 2022)

Fig:7Vosviewer colour graphic of keyword results: Keywords with more than 5 used in 2006-2022 articles

RQ:4Which type of learning methods Most successful one in the adoption with Moodle for teaching and learning?

Table:4 Successful learning Techniques adoption with Moodle for teaching and learningfrom 2006-2022 articles

Learning Techniques	Articles
Blended learning	Psycharis,et al.,(2013), Saqr, Fors, &Tedre, (2017),Popovic,et al., (2018) SuqiongFeng,(2018), Sáiz-Manzanares, et al., (2021), Romero,et al.,(2021),Fitriyana et al.,(2021),Bahri,et al., (2021), Xu, et al.,(2023).
Flipped learning/ Flipped classroom	Feng Hsu Wang,(2019),Saiz-Manzanares et al.,(2021),Laini, (2023).
Web based e-lerning/Samart tutoring	Vovides, et al.,(2007); Araka,et al.,(2019), Kerimbayev,et al.,(2020),Sáiz-Manzanares, et al.,(2019), Müller, et al (2021).
Collaborative learning/ Hybrid learning	Lazakidou&Retails.,(2010); Bognar,et al (2016),Oyelere, et al.,(2021),
Personalized learning	Despotović-Zrakić,et al.,(2012), Perišić.,et al.,(2017),Oliveira, et al.,(2022), Luch, &Cano, (2023)
Project/Problem based learning	Lazakidou, &Retalis, (2010), Sudianto,etal.,(2019)

The selected studies reported different learning methods applied the adoption and Moodle in teaching and learning support. The identified theories include the Blended Learning Method(BPL), Flipped Learning(FL)/Flipped classroom(FL), Web based learning(WBL), Virtual learning(VL), Collaborative learning(CL), Personalized learning(PL), Project based learning(PBL).

The findings can be seen in Table significantly BL(n=23) was the most commonly used method across from all the studies.This result is consistent with which established BL method analysed in technology adoption with Moodle successfully. The second influential learning method was seen, when implementation of FL (n=12) considerably the students feedback of the Moodle would be increased their motivation level. Third mostly adopted method was WBL(n=10) for development of constructivists approach. This would established the student's self-efficacy more in learning process. Furthermore the VL(n=6),PL(n=7),PB(n=3) can seen considerably with Moodle implementation successfully. Moreover, In fact, under such circumstances, LMS – Moodle proved that it is widespread adoption in practice and increasing popularity in research.

Discussions

From a practical perspective, LMS-Moodle has been supporting educators to enhancing teaching and learning efficiently. Since the first documents about Moodle was published in 2006, the number of Moodle-related researches and researchers has grown gradually year by year, reaching a total of 36 documents in 2022. This steady growth, to larger or lesser extents, reflects the widespread adoption of LMS in developed countries and developing countries in recent years from macro level as policies (Jogezai, et al., 2018; to micro level concerning teaching and learning practice (Cavus, 2013; Gasaymeh, 2017). The rapid growth in the number of publications in 2019 and 2022 can also be partly explained by the outbreak of the Covid-19 pandemic, which obliged most education systems across the globe to switch their teaching and learning mode from offline to online wholly or partly (Murphy et al., 2020). In fact, under such circumstances, LMS – Moodle proved that it is widespread adoption in practice and increasing popularity in research.

Conclusion

This comprehensive systematic review on Moodle use for online teaching and learning covers a wide range of educational sectors. From that bibliographic analysis, identified Moodle as a well-established and advanced learning platform for multiple disciplines and particularly used in education. LMS has received increasing attention from educational researchers in developing countries over the past 18 years from a longitudinal perspective. The number of publications on Moodle has been gradual increase during the first decade since its first publication in 2006 Most of the literature (65%) focus on university settings, with the majority (87%) on undergraduate studies. In terms of the geographical distribution, it is apparent that Malaysia, and Indonesia are leading country with the most publications, while in recent years Spain has (60 articles) emerged with significant growth in literature. The bibliographic analysis shows the increasing trend in Moodle educational research and provides information about the top journals, leading authors, keywords, and high citations. The thematic analysis finds that Moodle is a powerful tool used to support learning in various ways.

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