

Bibliometric Analysis of Online Learning: Future Research Agenda

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Abstract—Over the past few decades, online learning studies have been conducted by many researchers around the world, but there is no single right approach to online learning methods in education. Therefore, studies related to online learning are still needed in order to find the right online learning method in improving learning in education. This research is conducted with the aim to see and map the results of research that has been done around the world related to online learning by producing recommendations for future research that is still rarely done by previous researchers so that it can complete the gap of previous research. The method used in this research is bibliometric analysis using VOSviewer. Data searches from previous research results were carried out on the Scopus database which has excellent credibility in the publication of research results. The search on the Scopus database uses “Article Title, Abstract, and Keywords”. Based on the search results on the Scopus database from 1992 to November 2023. The research findings show that research related to online learning is spread almost all over the world. In addition, another finding is that the distribution of online learning research is mostly conducted in developed countries that have excellent internet facilities and access. The results of this study are expected to provide guidance for future researchers in conducting research related to online learning by looking at previous studies that have been conducted and suggestions for future research.

Keywords—online learning, bibliometric, VOSviewer

I. INTRODUCTION

During the COVID-19 pandemic that hit the world at the end of 2019 [1], the Indonesian government also made various efforts to reduce the spread of this virus, one of which was by implementing social restrictions and implementing a learning from home policy [2]. This has led to a transition from face-to-face learning to online learning [3].

Online learning is a learning method that is conducted through technology, especially through internet access [4]. In online learning method, learners do not need to be physically present in class, but can learn anywhere and anytime [5]. This online learning is done by utilizing various digital platforms such as Google Classroom, Zoom, Microsoft Teams, and others [6].

Online learning has advantages and disadvantages. The advantages are that students can learn anywhere and anytime without being bound by time and place as in face-to-face learning [7]. In addition, in online learning, learners are more flexible in choosing the material they want to learn and can access a wider range of information sources [8]. In this case, online learning method can also help learners develop independent skills and problem-solving abilities [9].

However, on the other hand, online learning also has its drawbacks. One of the disadvantages of online learning method is the limited social interaction between learners and

teachers [10]. In online learning, learners may miss out on direct social interaction with teachers and classmates, which can impact aspects of togetherness, confidence, and emotions [11]. In addition, poor internet access can also be an obstacle in some areas, so online learning cannot be done well.

Specifically, there are three main challenges in online learning, namely: 1) Technical challenge is one of the most common complaints from students when doing online learning [12]. Poor internet connection, difficulty in accessing the online platform, and overused devices are the main factors of technical challenges [13]. However, technical challenges should not be an obstacle for students and teachers. The first thing to do is to ensure a stable internet connection and prepare adequate devices for online learning [14]. In addition, students and teachers also need to master the use of the online learning platform. 2) The social challenge in online learning is the lack of interaction between students and teachers with fellow students [15]. During online learning, social interaction between students and teachers is often lacking, because unlike in-class learning, students and teachers do not interact directly [16]. This social challenge can be done in several ways. First, teachers and students can conduct online learning with interactive systems, such as web seminars or video conferences [17]. Second, teachers and students can organize a study schedule together, so that students can meet with classmates regularly [18]. Third, teachers and students can organize discussion forums to discuss certain topics, so that students can interact online with fellow students [19]. 3) The psychological challenge in online learning is the impact of the previous lack of social interaction [20]. Students who learn through online learning often feel isolated and are not allowed to hang out with classmates. This may cause depression, anxiety, or stress in students [21]. To overcome these psychological challenges, students and teachers need to work together to create a welcoming and inclusive online learning environment [22]. Teachers need to show more empathy and attention to students, while providing the necessary support and guidance according to students' needs [23].

To provide a clear picture of future research on online learning, it is important to understand previous research and existing research gaps. Therefore, this study aims to answer the following questions:

RQ1: Is research related to online learning still relevant for research in the future?

RQ2: How is the current development of research related to online learning?

RQ3: What are the theoretical and practical implications of research related to online learning?

Bibliometric analysis is applied to all meta data related to online learning obtained from the Scopus database. This analysis has been widely used to analyze previous research results and identify research gaps. The results of the bibliometric analysis will provide comprehensive insight and understanding for academics and practitioners in developing sustainable online learning in the future.

II. LITERATURE REVIEW

With the rapid growth of innovative technologies, education systems and institutions have shifted from traditional to online and digital modes of education [24]. Online technologies such as smart whiteboards, VR, apps, chat rooms, and LMS allow English teachers and students to form online learning communities [25]. Another interesting force is the COVID-19 pandemic, which imposed social distancing policies and distance learning around the world [26]. In this era, many universities and schools had to close their doors and shift from face-to-face education to online education [27]. Thus, they are forced to provide various tools to encourage internet access education to be highly digitized [28]. The form of instruction demands new educational behaviors that match the interactive features of the network [29]. Online education can be beneficial if it has some core characteristics, namely openness (providing equal learning opportunities and rights for everyone), extensibility (collecting and disseminating multiple educational resources, teaching modes, technologies, and interactions from different contexts for different contexts), flexibility (being used anytime and anywhere with a larger database), intermediation (mediating various educational tasks and activities through new technologies), and manageability (having interpersonal management during online instruction).

Before the pandemic, the use of e-learning was limited, but the deadly disease outbreak pushed educators towards a new mode of teaching whose success and quality are difficult to assess given the scarcity of statistics [30]. Practically speaking, online education requires teachers and students to use synchronous and asynchronous assignments and practices [31]. In synchronous courses, students participate in interactive, technologically enhanced instruction [32]. However, asynchronous activities involve tests, projects, assignments, group discussions, reflections, and feedback. Such activities are conducted through interactive video-based activities, online meetings, and webinars, and keynote speakers [33]. Regardless of its nature, online education has empirically been found to lead to many positive outcomes for education, in general [34]. However, other studies have pointed out the drawbacks of online education such as difficulties in maintaining student attention, classroom management, participation, interaction, and preventing negative emotions such as negative attitudes, stress, and boredom [35]. It is important to note that achieving success in this new model of instruction depends on several internal and external factors as described below [36].

Online learning is one of several distance learning strategies used around the world [37]. In the current COVID-19 pandemic situation that the world is facing, online learning is one of the main solutions for educational institutions to keep students and teachers learning and

teaching remotely [14]. However, this online learning approach is still an academic debate [38]. Some studies consider online learning as a positive change and helpful in improving student learning and performance, while some studies find flaws in this approach [39].

A. Virtual Learning

Virtual learning refers to the use of technology such as video conferencing, teleconferencing, and chat, to deliver learning materials to remote students [40]. The use of virtual learning is becoming a highly practiced learning process nowadays around the world. The teaching-learning process through virtual learning allows students to improve their learning ability without having to interact with their teachers and peers in the classroom [41]. In addition, the use of virtual learning allows students to learn and access learning materials anywhere and anytime according to their needs.

B. Combination of Virtual and Face-to-Face Learning

Combined Virtual and Face-to-Face Learning refers to using a combination of virtual and face-to-face learning to deliver student learning materials [42]. This type of learning allows students to benefit from both types of learning at once [43]. Students can learn through direct interaction with their teachers, but at the same time can also learn remotely through online.

C. Mobile Learning

Mobile learning refers to the use of mobile devices such as tablets or smartphones to deliver student learning materials [44]. Mobile learning allows students to learn anytime and anywhere with greater flexibility [45]. In addition, the use of mobile can help reduce learning costs as well as allow teachers to interact with students through mobile platforms [46].

The implementation of online learning involves teachers, students, and digital technology [47]. A number of studies have identified factors that contribute to success and failure in online learning implementation, such as the teacher's role in setting targets, class structure, interaction and assessment, use of virtual library, technology used, and administrative and management support [48].

III. METHOD

The rapid rise of online learning in recent decades has triggered extensive research, yet universally effective approaches remain elusive. This study uses bibliometric analysis of 8,372 Scopus publications to map existing research trends and identify knowledge gaps. By analyzing geographical distribution, lead authors, and emerging themes, the study aims to guide future research directions. The findings highlight a focus on developed countries and underscore the need for further exploration in areas such as virtual reality and experiential learning in online education. In addition, another finding is that the distribution of online learning research is mostly conducted in developed countries that have excellent internet facilities and access. The results of this study are expected to provide guidance for future researchers in conducting research related to online learning by looking at previous studies that have been conducted and suggestions for further research.

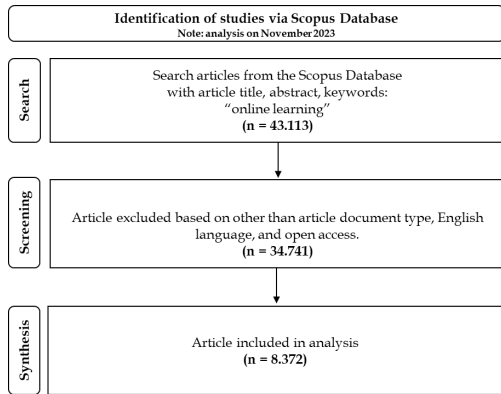


Fig. 1. PRISMA flow diagram.

Source: Authors elaboration based on Scopus database.

Based on search results in the Scopus database with article titles, abstracts, and the keyword “online learning”, 43,113 documents related to online learning were found (see Fig. 1). Then, these documents were selected based on article type, field of science, language, and open access. As a result, there were 34,741 documents that were excluded. These documents are then explained further in this research to answer research questions RQ1, RQ2, and RQ3.

Next, a bibliometric approach will be used to analyze the title, keywords, and abstract of each source that has been collected. This bibliometric analysis can help researchers to conduct accurate research by looking at the number of citations, country of publication, and main authors in the research field. Finally, analysis of research results on the collected meta data was carried out using VOSviewer software.

IV. RESULTS AND DISCUSSION

Based on mapping results in the Scopus database, there are 8,372 articles (Fig. 1) with a document type of 100% articles (Fig. 2), showing that the number of research on online learning continues to increase every year (Fig. 3). This shows that online learning is becoming an increasingly interesting topic for students, researchers. Research related to online learning first appeared in 1992. The study conducted by [49] with the title A learning mechanism to tune a neural network-driven fuzzy controller. This study conducted by [49] became the forerunner of online learning which is growing rapidly today, more so during the COVID-19 pandemic. The development of online learning studies to date has attracted the attention of researchers to study in more depth the impact of online learning on learning outcomes, both in schools, universities, and organizations. Studies related to online learning have been widely researched in various scientific disciplines such as social science, computer science, engineering, psychology, mathematics, and others (Fig. 4), this shows how urgent and important it is to understand online learning. A good understanding of online learning will have a major impact on educational and organizational progress.

Furthermore, the distribution of research based on affiliation shows that studies related to online learning are mostly conducted in these 10 universities (Fig. 5). The distribution of research related to online learning based on affiliation is dominated by Nanyang Technological University, Chinese Academy of Sciences, Ministry of Education China, Purdue University, University of Florida,

Monash University, University of Toronto, Deakin University, Zhejiang University, The University of Sydney.

Documents by type

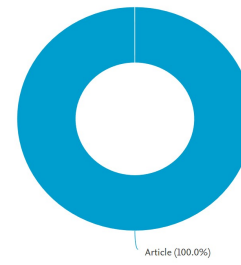


Fig. 2. Research data sources. Source: Scopus database (2023).

Documents by year

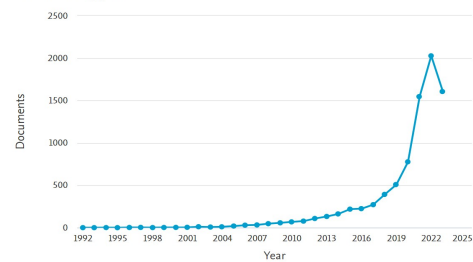


Fig. 3. Number of online learning publications. Source: Scopus database (2023).

Documents by subject area

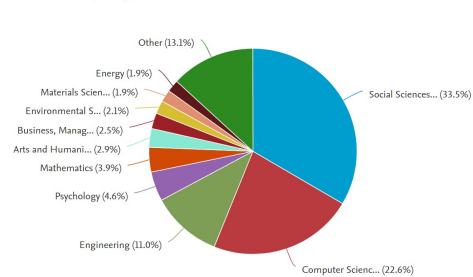


Fig. 4. Document by subject area. Source: Scopus database (2023).

Documents by affiliation

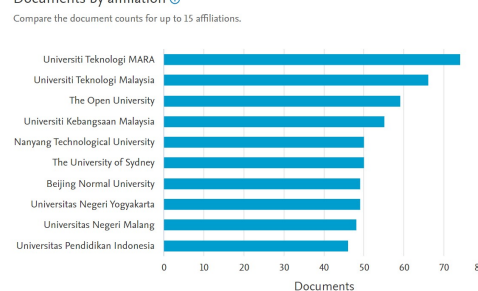


Fig. 5. Document by affiliation (top 10). Source: Scopus database (2023).

Documents by country or territory

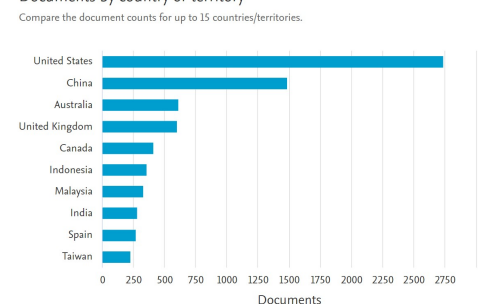


Fig. 6. Document by country/territory (top 10). Source: Scopus database (2023).

The distribution of research based on country/territory shows that studies related to online learning are mostly conducted in these 10 countries (Fig. 6). The distribution of research by country/territory related to online learning is dominated by United States, China, Australia, United Kingdom, Canada, Indonesia, Malaysia, India, Spain, and Taiwan.

The distribution of research based on country/territory shows that studies related to online learning are mostly conducted in these 10 countries (Fig. 7). The distribution of research by country/territory related to online learning is dominated by United States, China, Australia, United Kingdom, Canada, Indonesia, Malaysia, India, Spain, and Taiwan.

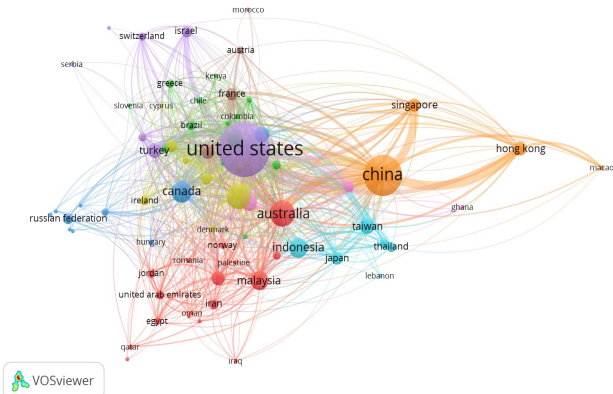


Fig. 7. Distribution of research by country/territory. Source: Data elaboration by VOSviewer (2023).

The distribution of research based on Author shows that most studies related to online learning are conducted by these 10 authors (Fig. 8). The distribution of research based on Author related to online learning is dominated by Hoi, Van Der Schaar, Zhao, Kozat, Lowenthal, Tekin, Shea, Pratama, Zhou, and Martin.

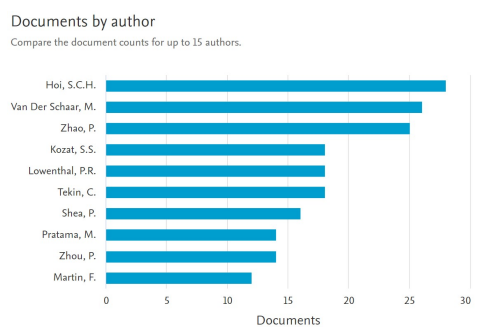


Fig. 8. Document by author. Source: Scopus database (2023).

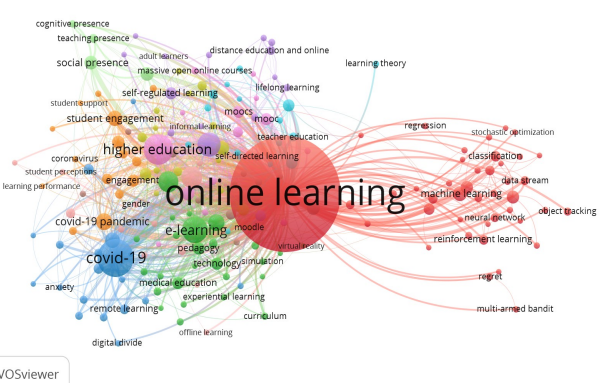


Fig. 9. Co-occurrence Network and visualization of keywords. Source: Data elaboration by VOSviewer (2023).

Based on the co-occurrence network analysis and visualization of keywords (Fig. 9) with bibliometrics related to online learning, there are several important things that can be considered for future researchers as follows:

First, future research is expected to explore more deeply online learning related to virtual reality, experimental learning, and others that are still rarely studied by previous researchers, this is certainly to develop future research.

Second, future researchers should include gender moderation variables in studying online learning in order to see how the difference between gender moderation on online learning can be useful for academics in improving student learning outcomes in the world of education.

The relevance of online learning research for the future is an important focus in the face of dynamic change. Although technological evolution brings significant changes, research related to online learning will remain relevant due to the essence of adaptation to such changes [50]. The sudden adoption during the COVID-19 pandemic revealed the urgency and potential of the distance learning model, raising the question whether this model will become the cornerstone of education in the future. Hybrid models that combine online learning with conventional learning open the door to a diversity of learning approaches, but need to be explored further. Nonetheless, accessibility challenges and social and psychological impacts remain relevant and a focus of attention for research and policy development. Thus, it can be concluded that research related to online learning has strong relevance and continues to make important contributions in describing the future direction of education. This answers the question RQ1: Is research related to online learning still relevant for research in the future?

Recent developments in research related to online learning reflect a dynamic evolution. Recent studies highlight various aspects, including the implementation of technology in learning, evaluation of the effectiveness of online learning methods, and a focus on student well-being and interaction in virtual environments. Research also explores the use of artificial intelligence and data analytics to enhance the online learning experience. These studies provide an in-depth look at the adaptation and improvement of distance learning models [51]. This, recent developments in research related to online learning reflect intense efforts to optimize the learning experience through the use of technology and focus on student well-being in a digital environment. This answers the question RQ2: How is the current development of research related to online learning?

Research into online learning has significant theoretical and practical implications. From a theoretical perspective, this research makes an important contribution to the development of learning theory, stimulating debate about the interaction between technology and human learning processes. These implications pave the way for the enhancement of constructivism theories or collaborative learning theories by considering the impact of online interaction on knowledge formation. Practically, this research provides valuable guidance for curriculum development, instructional design, and the application of technology in education. By understanding these findings, educators can design online learning environments that are more effective and responsive to students' needs [52]. In conclusion,

research related to online learning has theoretical implications that complement learning theories, while practically providing valuable guidelines for designing effective learning environments in the digital age. This answers the question RQ3: What are the theoretical and practical implications of research related to online learning?

V. CONCLUSION

A bibliometric analysis has been conducted by reviewing 8,372 articles retrieved from the Scopus database to explore the major research themes in education specifically in online learning. The findings reveal that research related to online learning is concentrated in developed countries and accounts for the largest proportion of publications listed on the Scopus database. Five subthemes were identified to receive the most scientific attention, such as pedagogy, curriculum, learning outcomes, virtual reality, and experiential learning. In addition, the findings from the bibliometric results identified important theoretical contributions, including the fields of online or blended learning and management education, to extend existing online learning theories.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

Dakhliatunnavaiah conducted extensive literature reviews, participated in data collection activities, assisted with data analysis under the supervision of lecture, and contributed to the writing of the manuscript; Banu Setyo Adi provided overall guidance and mentorship throughout the research process, and insightful feedback on research design, methodology, and data analysis, and contributed significantly to the interpretation of research findings and their implications; both authors had approved the final version.

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