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NEED ANALYSIS OF MOBILE LEARNING AT JUNIOR HIGH SCHOOL IN INDONESIA: A BLIOMETRIC STUDY

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ABSTRACT

This research examines the need for mobile learning at Indonesia's junior high school. Mobile learning *is a learning approach that uses mobile devices and digital technology to support the learning process. This research aims to understand research trends related to mobile learning and the need for mobile learning in Indonesian junior high schools. This research uses bibliometric analysis to evaluate mobile learning research trends in Indonesian junior high schools. Bibliometric analysis involves collecting and analyzing relevant bibliographic data or scientific publications. The research uses four application tools. First, Publish or Perish was used to search for scientific articles by keyword, resulting in 752 articles. Then, through Mendeley, filtering was carried out based on specific criteria, resulting in 561 articles. Next, Covidence filtered articles in detail, resulting in 158 relevant articles. Finally,VOS viewer is used for data visualization with co-occurrences. The results of the bibliometric analysis show that research on mobile learning in Indonesian junior high schools has increased significantly since 2020. Various disciplines are involved in mobile learning research, primarily focusing on mathematics, science, and language education. Apart from that, the field of information technology also has a vital role in developing mobile learning applications and infrastructure. This research provides an objective view of research trends and mobile learning needs in Indonesian middle schools, provides direction for further research, and supports the development of more innovative and inclusive education in the future.*

Keywords: *mobile Learning, indonesian junior high school, bibliometric analysis, educational development*

1. INTRODUCTION

Technological developments have a significant impact on education in schools. Technology has expanded access to education, reaching broader demographics, breaking down geographic barriers, and enabling diverse students to benefit from educational resources. Mobile learning is increasingly popular in various contexts, especially in education, due to the increased ownership of mobile devices and advances in mobile applications that provide practicality, comfort, and flexibility in the learning process (Little., 2011).

Apart from that, the COVID-19 pandemic has also accelerated the implementation of mobile learning, opening our minds to the need to highlight the importance of technology in education. The COVID-19 pandemic has changed how human activities are carried out in various sectors, including education, encouraging the development of distance learning through information and communication technology (ICT). In Indonesia, the use of ICT in education has increased rapidly over the last three years, mainly due to the pandemic. The government and educational institutions focus on technology to overcome educational problems during the pandemic, avoiding the risks of traditional face-to-face methods (Kamaludin et al., 2022; Zakiyya. H., 2022). Technological developments have provided a significant impetus for developing and implementing mobile learning systems in schools. These advances create new opportunities in education, increasing the accessibility and flexibility of learning.

Mobile learning relies on mobile devices and digital technology, such as smartphones and tablet computers, to support and enhance the learning process (Ferreira et al., 2013). According to Newby et al., (2006), mobile learning is defined as learning in various places, contexts, through social interaction and content using

mobile electronic devices (Newby et al., 2006). Mobile learning is mobile learning that utilizes mobile technology so that students can learn anywhere without time and place limitations. Mobile learning is a learning model that utilizes information and communication technology. Mobile learning can be defined as the use of mobile devices, such as mobile phones, tablets and laptops for teaching and learning purposes. With features such as portability, social connectivity, context sensitivity, and individuality mobile devices have made computer-based education more accessible and integrated with learning and teaching scenarios (Han, 2022). Mobile learning is an essential new learning paradigm in a knowledge-based society, with independence in learning time and place. Mobile learning also encourages visualization, interactivity, and efficiency, even in teaching children with disabilities (Izhdeneva, 2021). With mobile platforms, students can access content anywhere and at any time, creating a flexible learning approach that is responsive to individual needs (Ferreira et al., 2013).. Mobile learning can support nursing student engagement and learning in pre-simulation preparation, and in the pre-briefing and debriefing phases of clinical simulations (Costa et al., 2022).

In the context of the potential for mobile learning in Indonesia, research results and findings illustrate how mobile devices, such as cell phones, can play an essential role in supporting education and learning in this country. Research shows that students in Indonesia are very accustomed to using mobile devices and applications and have a favorable view of mobile learning (Suana, 2018). In addition, other findings reveal that mobile phones have the potential to help provide equitable access to education, especially in rural and remote areas in Indonesia (Suherman et al., 2020). Thus, mobile phones can be considered a tool with great potential in the context of mobile learning in Indonesia, given their role in supporting education and learning in this country (Garg et al., 2022).

Mobile learning provides students with learning flexibility. They can access materials, multimedia interactions, and independent learning, increasing their understanding of various subjects. With content adaptation and progress monitoring, mobile learning supports personalized learning. It is also inclusive for students with special needs and allows for collaboration.

Mobile learning has been proven to be a valid, practical, and effective method for teaching procedural and conceptual knowledge of fractions to elementary school students (Andriah & Amir, 2021; Yani et al., 2022). Its validity lies in aligning content and methods with educational standards, ensuring that the approach covers important fraction concepts. From a practical perspective, mobile learning is feasible and convenient for teachers and students, considering factors such as accessibility and integration into the curriculum.

Additionally, mobile learning has demonstrated its effectiveness by improving students' understanding of fractions, as evidenced by increased assessment scores, higher retention rates, and better overall performance in fraction-related assignments. This approach leverages the capabilities of mobile devices and applications to create engaging and meaningful learning experiences for young learners.

Mobile learning has been proven to be an effective strategy for improving learning practices and improving communication, engagement, and outcomes of student learning experiences (Andriah & Amir, 2021; Jan et al., 2016; Salhab & Daher, 2023).

Critical factors influencing learner engagement in mobile learning applications include usability, availability of learning experiences, features to facilitate learning, interaction between individuals, and incentives to complete learning (Liu & Correia, 2021). Mobile learning has transformed traditional education into a more accessible, interactive, and engaging experience. By providing flexibility, encouraging collaboration, offering multimedia resources, and improving communication, it has become a valuable tool for universities looking to improve learning practices and enrich the educational journey for their students.

Mobile learning systems can also provide teachers with new ways to engage students through interactive quizzes, games, and other multimedia content (Coello-Vásquez, 2019). Mobile learning provides teachers with various ways to make learning more exciting and compelling. By utilizing mobile technology, teachers can create a more interactive and dynamic learning experience, which can help students achieve a better understanding of the subject matter.

Teachers can easily create quizzes relevant to the lesson material, and students can answer them via mobile devices, which makes learning more exciting and helps teachers measure students' understanding of the

subject matter. In addition to interactive quizzes, mobile learning systems can also offer educational games. This game is designed to teach lesson concepts in an interactive and fun way. Students can learn while playing, which can increase their motivation to learn.

Finally, mobile learning presents some significant economic advantages compared to traditional teaching methods. One of the main benefits is reduced reliance on physical textbooks and other printed materials. In traditional teaching methods, educational institutions and students often have to spend large amounts of money to purchase textbooks, journals, and other printed materials needed for learning (Somasundaram et al., 2021).

Thus, mobile learning systems enable more affordable education and are more sustainable from an ecological perspective, making education more inclusive and helping reduce the financial burden on students and educational institutions.

In conclusion, mobile learning in education offers many significant advantages, such as accessibility, flexibility, increased student understanding, practicality, efficiency of use, interactivity, and reduced costs, making mobile learning a valuable tool in changing the way learning and teaching are done, increasing inclusivity, and enriching the educational experience for various types of learners.

Previous research on the use of mobile learning for Indonesian students at the junior high school level was reviewed by (Somasundaram et al., 2021). This research examines the use of mobile augmented reality in physics learning for junior high school students in West Java Province, Indonesia. The research results show that when students use mobile augmented reality, they achieve better learning achievements than textbooks. Qualitative data collected through interviews with students after they used mobile augmented reality indicated that augmented reality technology provides an effective learning environment that helps students understand physics concepts better, improves their achievement, and makes abstract concepts more real through visual simulations. 3D.

Another study (Winzky & Aswir, 2022) evaluated how first-year students at an Islamic junior high school in Indonesia responded to using mobile applications to improve their English pronunciation. The results revealed that students gave a positive view towards the use of mobile applications in learning English pronunciation, which could contribute to improving their English pronunciation skills.

Other research examines the impact of mobile augmented reality on physics learning outcomes and students' perceptions of using this technology. There were 64 participants in this research, who were students from grade 7 at a junior high school in West Java Province, Indonesia. This research reveals that students who use mobile augmented reality show higher levels of learning achievement compared to students who rely on textbooks as their learning resource (Rahmat et al., 2023)

A study conducted in East Nusa Tenggara, Indonesia, aimed to see high school students' responses after they participated in mobile learning. For two weeks, students were involved in mobile learning focusing on physics subject matter. The results of this research conclude that students in this area receive mobile learning well (Winzky & Aswir, 2022).

Finally, a study that compiled interactive teaching materials used the Edmodo platform as an alternative natural science (science) learning media to improve junior high school students' critical thinking skills. The results of this research conclude that Edmodo-based interactive teaching materials can function as an alternative science learning media that meets the criteria for validity, ease of use, and effectiveness.

Even though the advantages of mobile learning have been proven to bring benefits, several challenges and obstacles are visible for schools in Indonesia in implementing mobile learning. One of the main challenges is the need for more infrastructure and connectivity in some regions, which hinders access to mobile learning resources, especially for students living in remote areas. These obstacles can limit the potential of mobile learning to reach all students.

Another significant obstacle is teacher training in implementing mobile learning technology effectively. Many teachers still need to gain sufficient skills or knowledge to integrate mobile learning into their teaching methods, which can influence the effectiveness of mobile learning in achieving educational goals. Other challenges include developing high-quality mobile learning content, especially for subjects requiring interactive and multimedia resources. An adequate content development process requires a sufficient investment of time and

resources. Finally, pedagogical challenges must be addressed, such as ensuring that mobile learning activities align with learning objectives and can produce engaging and compelling learning experiences for students.

Implementing mobile learning in Indonesian schools requires significant investments in infrastructure, teacher training, and content development. However, if these challenges can be addressed effectively, mobile learning can improve student engagement and academic performance, bringing positive benefits to the world of education.

This study uses bibliometric analysis to assess the need for mobile learning in Indonesia's junior high school education context. *Bibliometric analysis* is a research approach that collects and analyzes scientific publication data relevant to this topic. The main objective of this research is to understand research trends, existing weaknesses, and the potential for developing mobile learning in junior high school education in Indonesia. Through this method, research can provide a more objective view of how mobile learning can effectively overcome educational challenges in Indonesia.

Bibliometrics can be applied in various fields, including education, mathematics, information architecture, and program coordination. *Bibliometrics* is a quantitative method used to measure, track, and analyzing scientific literature that involves analyzing patterns of publications, citations, and collaboration between researchers in a particular field (Bornmann & Hug, 2020). Bibliometric analysis can be used to identify trends, patterns, and gaps in research and to disseminate research impact (Burma Oglu et al., 2019). Bibliometric analysis can provide valuable insight into research developments in a particular field, which can help researchers and policymakers identify gaps and opportunities for future research. In addition, bibliometric analysis can also be used to form a conceptual framework for further research and develop theory in a field.

Therefore, this research uses bibliometric analysis to describe and map scientific articles related to the need for mobile learning at junior high school level in Indonesia. Through this analysis, trends in the number of research that have been published, research trends from various scientific disciplines, and keywords that often appear together in publications will be seen. Apart from that, this research also conducted a content analysis of all articles to understand the efforts to address the need for mobile learning at the junior high school level. Apart from that, this research also tries to identify regions in Indonesia that are the main focus of research related to mobile learning in the context of junior high school-level learning.

2. METHODS

The research used bibliometric analysis, which is a quantitative method for analyzing bibliographic data in articles and journals. The application tools used are: Publish or Perish, Covidence, Mendeley, and VosViewer. These are the complete descriptions:

2.1 Publish or Perish

The data collection method used in this research begins with using the Publish or Perish application, which allows researchers to quickly and efficiently identify and access scientific articles that are relevant to their research. This approach helps support research methodology and knowledge development in Indonesia's mobile learning context.

The first step is setting search keywords that match the research focus. Keywords used include "mobile learning for Indonesian junior high schools" and "mobile learning for junior high schools." By setting these keywords, the search becomes more focused, making it possible to find articles relevant to the research topic.
The combination of the three keywords above produces 752 articles that are relevant to the research topic. After getting the search results, each keyword's data is exported to RIS format for further processing using Mendeley.

2.2 Mendeley

Next, search results from the Publish or Perish application are filtered according to predetermined criteria. These criteria include, namely, that the article is scientific research, published in a scientific journal, indexed in Google Scholar, and published between 2013 and 2023. This filtering was carried out through Mendeley; this

produced 561 articles. Besides filtering through Mendeley, we also complete author keywords to simplify the subsequent analysis process.

Covidence

The data is then processed through the Covidence application. This application will filter article data in detail in two stages :filtering based on title and abstract and filtering based on full text.One by one, the articles will go through these two stages to avoid duplication and get increasingly relevant. The results of the screening on Covidence were 158 relevant articles. Covidence is a platform that combines technology and methodology to help researchers run systematic reviews more efficiently, save time, and ensure that the correct methodology is used in their investigations.

2.3 VOSviewer

A total of 158 articles were then visualized via bibliometric software, which introduced literature data samples and drew a knowledge map. Vosviewer presents the overall external characteristics of a subject area, and this software has unique advantages, especially in clustering analysis (Huang et al., 2022).

The search and filtering of articles carried out can be seen in the data collection and analysis flow in Figure 1 below.

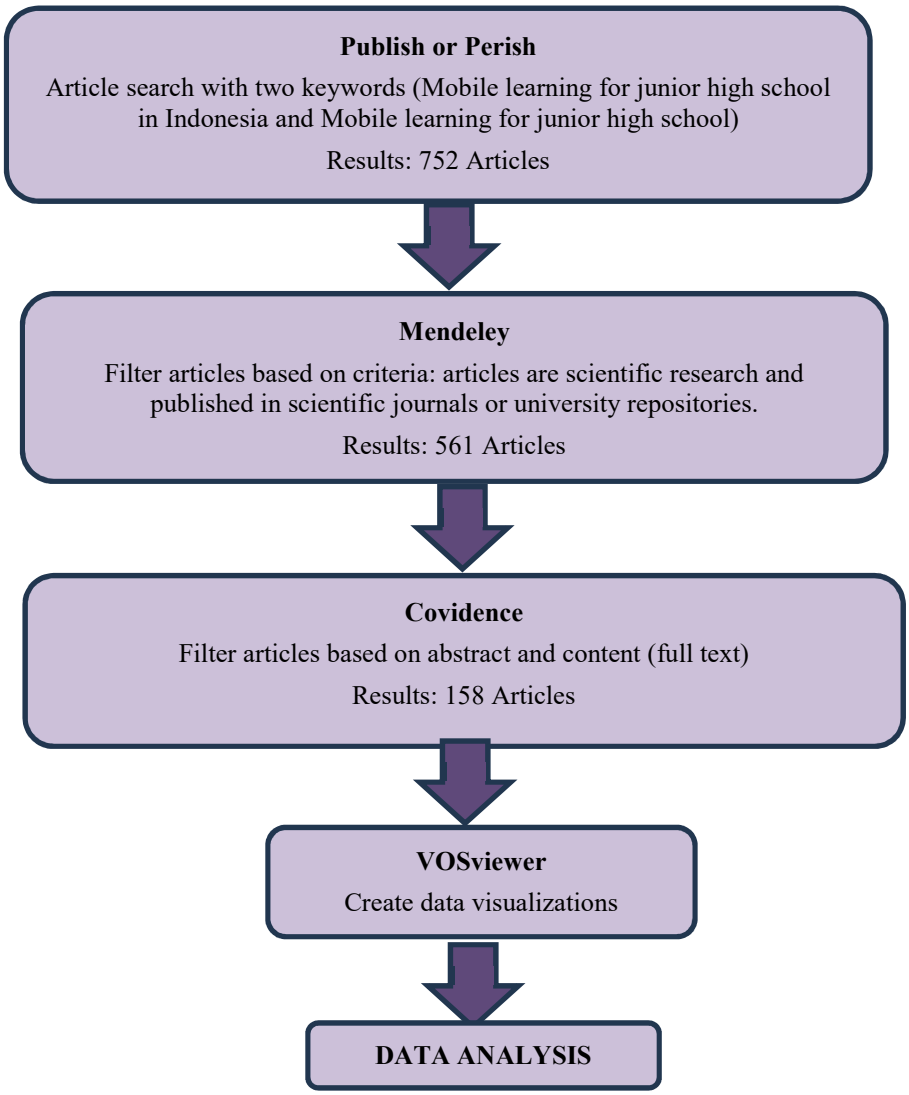

Figure 1. Article Search and Filtering Process

3. RESULTS & DISCUSSION

3.1 Trends in Mobile Learning Research Publications at the Indonesian Junior High School

Judging from the Research Publication Trends, after conducting a search using the keywords "mobile learning for junior high school Indonesia" and "mobile learning for junior high schools," which were accessed on September 17, 2023, as well as going through the filtering stages via Mendeley and Confidence, from 2011 to 2023, research related to mobile learning at junior high schools in Indonesia has experienced a significant increase since 2020, coinciding with the COVID -19 pandemic.

The following is a graph of research trends from 2011 to 2023, processed by researchers:

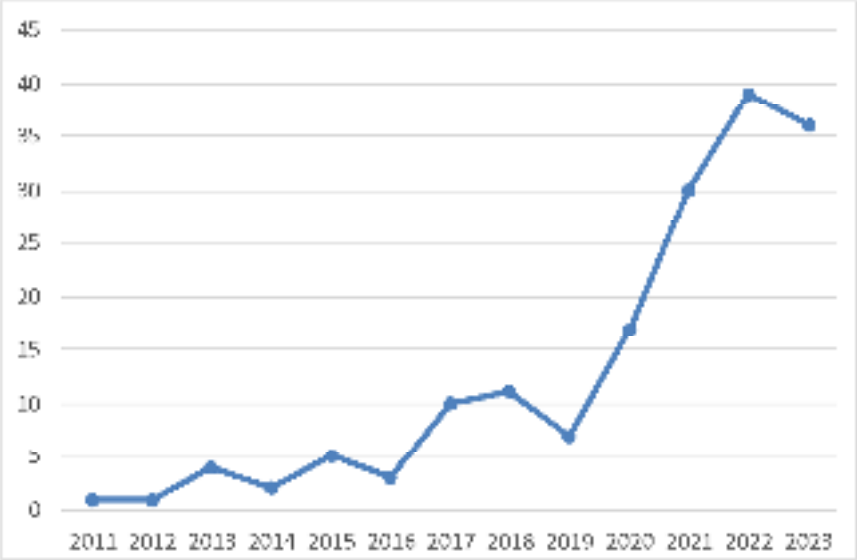

Figure 2. Research Trend Graph

Based on search results, research on mobile learning has increased significantly since the COVID-19 pandemic hit, and the pandemic has changed the educational landscape, forcing many educational institutions to switch to distance learning. Mobile learning, which uses technology and mobile applications to support the learning process, is becoming increasingly important as researchers realized that it can effectively bridge learning gaps when face-to-face learning is limited. The increasing use of mobile devices and broader internet access also make mobile learning research increasingly relevant, opening up new opportunities for educational innovation and developing better educational technology. Therefore, COVID-19 has triggered increased interest and research in the mobile learning domain, creating new opportunities and challenges that must be overcome in an increasingly digital educational era.

3.2 Writing Trends on the Use of Mobile Learning at Indonesian Junior High School Based on Scientific Disciplines

From the scientific area, it can be seen that the writing of articles on the use of mobile learning comes from various scientific disciplines, as seen in Figure 3 below.

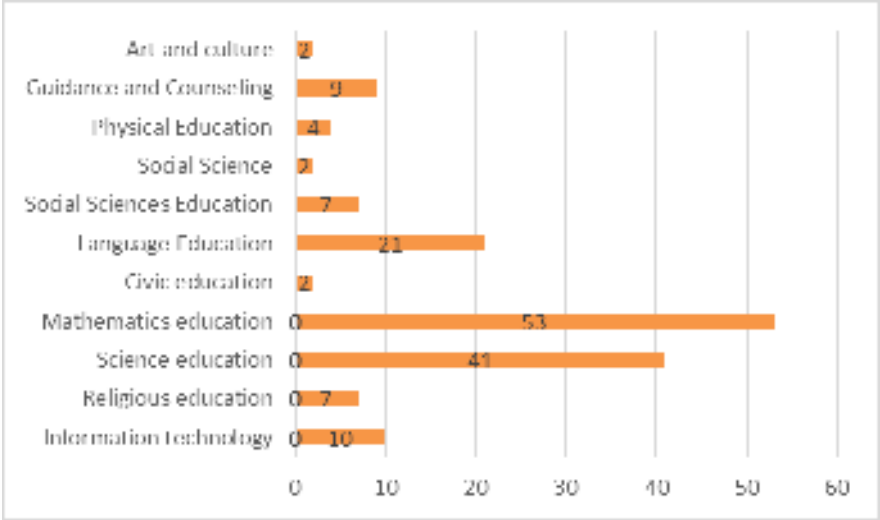

Figure 3. Research Trends Based on Scientific Fields

This table provides an overview of research trends in various scientific fields related to mobile learning using mobile technology. In this table, mathematics education and science education are the two fields that attract the most attention in the context of mobile learning. Much research has focused on using mobile technology to improve learning and teaching methods in these two fields. Language education has also received significant attention for developing language skills through mobile applications and text-based learning. Information technology, which is naturally related to developing mobile applications and technological infrastructure that supports mobile learning, is also highlighted in this table. Guidance counseling is another area that may involve using mobile technology to provide counseling services and educational guidance to students.

In addition, the fields of religious education, social sciences education, physical, artistic and culture are also involved in mobile learning in more specific ways. Although the number of studies in these areas is lower in the table, the relevance of using mobile technologies in an educational context remains.

Thus, this table illustrates the extent to which various scientific fields have explored and applied mobile learning in their teaching and research methods, reflecting the diversification of the use of mobile technology in various aspects of learning and teaching in various scientific fields.

With the various disciplines involved in mobile learning, students in Indonesia can expand their knowledge and develop relevant skills, which will ultimately help them face the challenges of education and an increasingly technology-based future. Mobile learning is a trend and an effective tool for advancing education in Indonesia.

3.3 Co-occurrence

Apart from the number, year of publication, and scientific disciplines studied, the need for mobile learning at the junior high school level in Indonesia is studied. The author also tries to illustrate the relevance of this topic by looking at the terminology used when searching using different terminology using the VOSviewer application (see Figure 4).

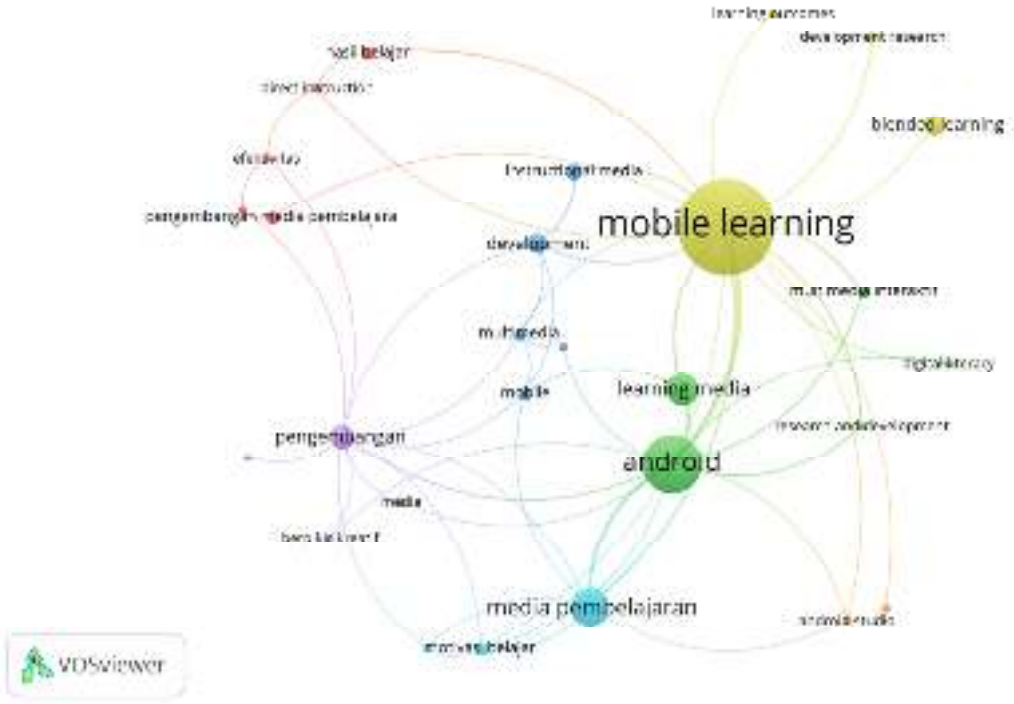

Figure 4. **Co-occurrence**

Figure 4. above shows a visualization of the keyword network used by the author in writing about efforts to utilize mobile learning in Indonesia, especially at junior high schools using the VOSviewer application. Using terminology in visualizing networks in VOSviewer, study objects are described as items, while the relationships between study objects are referred to as links (van Eck & Waltman, 2023). Links themselves have levels (strength) that are described by values. The high values, the higher the level of relationship strength. However, in its visualization, VOSviewer does not show how strong the relationship is, only the thickness of the line, and also only shows the number of connections between items. Apart from items and links, VOSviewer also shows clusters for each item that appears (as seen from the color differences).

In network visualization, the author focuses on items of relationships between keywords (co-occurrence links between terms). From search results with a minimum number of the exact keywords of 3, the author found that of the 327 linked/searched for, there were 28 connected items divided into 7 (seven) clusters.

To simplify the grouping process, the author then gives names to the groups based on numerical order. **Cluster 1** consists of 5 items: direct instruction, effectiveness, learning outcomes, feasibility, and the development of learning media**. Cluster 2** comprises five items: Android, digital literacy, learning media, interactive multimedia, research, and development. **Cluster 3** consists of 4 items: development, instructional media, mobile, and multimedia. **Cluster 4** consists of 4 items, namely blended learning, development research, learning outcomes, and mobile learning. **Cluster 5** comprises positive thinking, media, and smart app creator development. **Cluster 6** consists of M-learning, learning media, and learning motivation. Finally, **cluster 7** consists of Android Studio and applications.

From the network visualization, it can also be seen that the item with the highest occurrence is "mobile learning," with 48 occurrences. These occurrences indicate how many articles appear when this keyword is used and provide essential information on topics and discussion material in the related journal, followed by the keywords Android, learning media, and development.

3.4 Need Analysis of Mobile Learning for Junior High School in Indonesia

Mobile learning is an educational innovation that is increasingly receiving attention in various countries, including Indonesia. At the junior high school (SMP) level, it is vital for students to be familiar with mobile learning because technology in education provides various benefits and essential preparation for their future. Several studies show that mobile devices and digital tools can facilitate learning and increase motivation among middle school students. For example, making mobile learning more interesting in the classroom can help students understand lessons and increase their learning motivation (Albantani & Rahmadi, 2020; Honório et al., 2018).

The need for mobile learning is also strengthened by data showing that the education gap in Indonesia is very high. Many students still need access to high-quality education, especially in remote and isolated areas. According to data from the Central Statistics Agency (BPS), school participation in Indonesia is still low, especially at the secondary education level. In 2019, the participation rate for junior high schools (SMP) in Indonesia was only 88.67%. In addition, many schools in Indonesia must have adequate educational facilities and resources. According to data from the Ministry of Education and Culture, in 2019, only around 60% of schools in Indonesia had internet access. Based on that data, mobile devices such as smartphones and tablets can solve education gaps in Indonesia. Using mobile devices, students in remote and isolated areas can access high-quality educational resources that may not be available at their schools. This can help increase school participation and improve the quality of education in Indonesia.

Understanding mobile learning from a junior high school age also significantly impacts their development when they become professionals in the future. One is the ability to continuously access up-to-date information that is only sometimes available in traditional textbooks. This helps students build lifelong learning habits that will be beneficial when they become professionals in various fields. So, understanding mobile learning at an early age will positively impact their readiness to continue learning and developing in the future.

For example, a Canadian study involving health and social services professionals found that mobile learning immensely helped professionals gain better access to the latest information in their field, allowing them to stay informed about current developments (Curran et al., 2019). Another example of research on continuous professional development for teachers in Indonesia shows that mobile learning can effectively provide the latest information and expand teachers' knowledge and skills beyond what they learned during initial training (Effendi & Hendriyani, 2018).

Furthermore, research in Zambia examining the use of mobile technology in mathematics education shows that mobile devices can provide students with access to the latest information and support the development of critical problem-solving skills (Nkhata & Mwanza, 2018). Thus, mobile learning is the key to overcoming educational challenges and giving middle school students in Indonesia access to the latest knowledge to help them grow and develop. This is essential to promoting equality in education and preparing young people for an increasingly digital world.

4. CONCLUSION

Technological developments, especially mobile learning, have significantly impacted education at the junior high school level in Indonesia. The application of mobile learning has increased along with the development of mobile device ownership and mobile applications that enable more flexible and practical learning. The COVID-19 pandemic has also accelerated the use of mobile learning, highlighting the critical role of technology in education. The research results show that students in Indonesia are very accustomed to using mobile devices and have a favorable view of mobile learning. Mobile phones have great potential to support equitable education, especially in rural and remote areas in Indonesia.

Mobile learning provides students flexibility, allowing them to access material anytime and anywhere, and support personalized learning. Research also shows that mobile learning effectively improves student understanding, grades, and overall performance in certain subjects, such as math and science.

Although mobile learning has many advantages, several challenges must be overcome, including infrastructure and connectivity problems in remote areas, a lack of teacher training in integrating technology and developing high-quality learning content. However, if these challenges can be addressed effectively, mobile

learning has great potential to improve student engagement, academic performance, and inclusivity in education in Indonesia.

Bibliometric research also provides insight into research trends, comparisons of contributing disciplines, and keywords frequently appearing in articles. The results of this bibliometric analysis help understand the development of mobile learning research at the junior high school level in Indonesia, which is increasingly relevant in modern education.

To face educational challenges and realize more inclusive and sustainable education, implementing mobile learning in schools in Indonesia requires significant investment in infrastructure, teacher training, and content development. However, the potential for mobile learning to advance education in Indonesia is accurate, and this is the right step towards a more technology-based educational future.

Bibliometric studies highlight the diversity of disciplines that have explored and applied mobile learning in their teaching and research methods, reflecting the diversification of the use of mobile technologies in various aspects of learning and teaching across various disciplines.

Mobile learning research publication trends have significantly increased since 2020, especially in response to the COVID-19 pandemic. This indicates that mobile learning has become an effective solution for bridging educational gaps during limited face-to-face learning.

All the results of this research emphasizes the vital role of mobile learning in changing education and learning in Indonesia and offer an excellent opportunity to make more use of it to improve education at the junior high school level. Mobile learning is the right solution to provide quality and equitable education, especially in remote and isolated areas, while also providing flexibility and interactivity in learning.

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