Development of A Mobile Learning-Based Statistics Learning Model: Bibliometric Analisys

Suci Haryanti[1,2], Basuki Wibawa and Eveline Siregar

[1] State University of Jakarta, Jakarta,13220, Indonesia
[2] Akademi Refraksi Optisi Kartika Indera Persada, Jakarta,10520, Indonesia
betasenja1@gmail.com

Abstract. To improve learning achievement in statistics education with a focus on quantitative research, which is difficult for some students to understand, the use of mobile learning as a learning media is needed. This study aims to analyze the implementation of mobile learning in statistics education using a bibliometric approach with VOSViewer software. The method used in this study is bibliometric analysis. There are 3 clusters identified through VOSViewer software. The research articles used in this study are obtained using the keywords "statistical model," "model development," and "mobile learning" from the past 5 years, specifically from 2018 to 2023. The findings of this study reveal 4 clusters that discuss the application of mobile learning in statistical models. The analysis using VOSViewer indicates that the term "mobile learning" has not appeared frequently, suggesting that there are not many studies on mobile learning. This finding is significant when considering statistics education, particularly in terms of learning media.

Keywords: microlearning, statistics education, model development, bibliometric analysis.paper.

1 Introduction

With rapidly advancing technology, the field of education has also kept pace by utilizing various technology-based learning media. This makes learning more enjoyable and facilitates the achievement of learning objectives. In statistics education, providing contextual learning and reinforcement through videos and supplementary books that can be revisited after offline learning sessions is important. The second scenario suggests two consecutive stages in the learning process: calculations using statistics and chunk construction. Chunks are derived from previous statistical calculations. Generally, chunk boundaries are identified as the points where the predictability of consecutive or adjacent elements is at its lowest. This interpretation is widely accepted in second language research, whether it involves spoken stimuli or visual scenes [1],[2] . Students are able to establish an efficient and productive learning environment by using realia media in and around the classroom.[3]

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[4]Mobile learning can be used and expanded to create a new, more democratic, modern, and instructive learning culture. Societal culture is made up of much more than merely exploring culture. The integration of all artifacts, concepts, institutions, methods of production, customs, patterns of behavior, values, and attitudes that are transmitted from one generation to the next in changing forms is referred to as a society's culture. [5] People frequently think of mobile learning in terms of the actual electronic equipment. The most widely used portable electronics are notebooks, laptops, and smartphones. However, a number of extra features—such as audio, cameras, auxiliary apps, and others—help with the deployment of mobile learning. All of these technologies contribute to maximizing the effectiveness of mobile learning, enhancing the accessibility of learning materials. One aspect of "mobility" in the context of this study pertains to the technological capabilities that enable students to engage in educational activities within physical settings. On the other hand, it also encompasses the actions and behaviors of learners as they utilize technology for the learning process. Furthermore, it encompasses the attitudes of students who themselves exhibit high mobility while utilizing mobile technology for educational purposes.[6]

The urgency lies in the need for more studies and research on mobile learning in statistics education. Using a bibliometric approach and analyzing research articles from the past five years, the study identified only a limited number of articles discussing the application of mobile learning in statistical models. This scarcity of research suggests a gap that needs to be addressed.

Mobile learning has the potential to enhance statistics education by providing interactive and accessible learning experiences. It can offer students opportunities for hands-on practice, immediate feedback, and personalized learning. By leveraging mobile devices, such as smartphones and tablets, students can engage with statistical concepts anytime and anywhere, increasing their understanding and retention of the material. Over the course of two semesters, 63 students from our university's undergraduate and graduate programs participated in the m-learning application experiment. At the end of the semester, students use a range of W/H devices in an m-learning environment and report on their experiences through surveys and interviews. This exploratory study's findings help to clarify the function of mobile technology in higher education. [7] Not only that, in the outdoors can also use mobile learning such as research [8] Taiwan's three elementary schools observe birds using the BWL system. Formative assessments of their encounters are completed. These results demonstrated that children who used birding systems learned more than they would have otherwise expected to learn.

2 Method

This study use bibliometric analysis as its methodology. The gathering, examination, and interpretation of bibliographic data or bibliograph-ic information gleaned from bibliographic databases are typically included in the field of biblimetrics. The production, influence, and impact of scientific and research effort in a field of science are then assessed using this bibliographic data. The information provided discusses the

use of a bibliometric approach to analyze research. It involves examining the total number of publications derived from a specific source and the overall citations received by those publications. By assessing the number of citations obtained divided by the total number of publications, one can determine the impact and influence of the research. This approach also utilizes keywords, title keywords, and keywords to identify technology or research orientation patterns. In the study mentioned, the researchers combined the bibliometric approach with VOSviewer software to analyze research conducted in the year 2018 [9].

Researchers can examine bibliographic material and examine citations from individual articles using the bibliometric analysis approach, which is based on Harzing's Publish or Perish database.[10] As a result, using bibliometric mapping, researchers identify the study topic to be examined, which is the use of mobile learning in statistical learning. In this research, the authors utilized bibliometric techniques to develop a novel methodology for conducting topic analysis using text analytics. The proposed approach incorporates both bibliometrics and text analytics, utilizing metadata collected during the study.[11]

Up to 200 papers from the Publish or Perish database, which was obtained from Google Scholar, were used for the bibliometric study. The research articles were searched using Publish or Perish with keyword searches for "statistical learning" and "mobile learning". All articles are collected from the Google Scholar database. To keep the article up-to-date, researchers determined the range of search years for the last 5 years starting from 2018-2023. Then, using VOSViewer software, the RIS-formatted metadata from Publish or Perish is processed to provide visualizations in bibliometric maps. Bibliometric visualization techniques specifically to map groups of relationships between journals, co-authoring authors, and the emergence of keywords to find out related developments about microlearning in statistical learning.

3 Results and Discussion

In the analysis of the application of mobile learning in physics learning with the binary method, 3557 words were obtained with the minimum limit of occurrence of each word set 10 times, then 66 words were obtained. Then, 4 clusters were grouped The results of the binary method analysis showed a more compound grouping

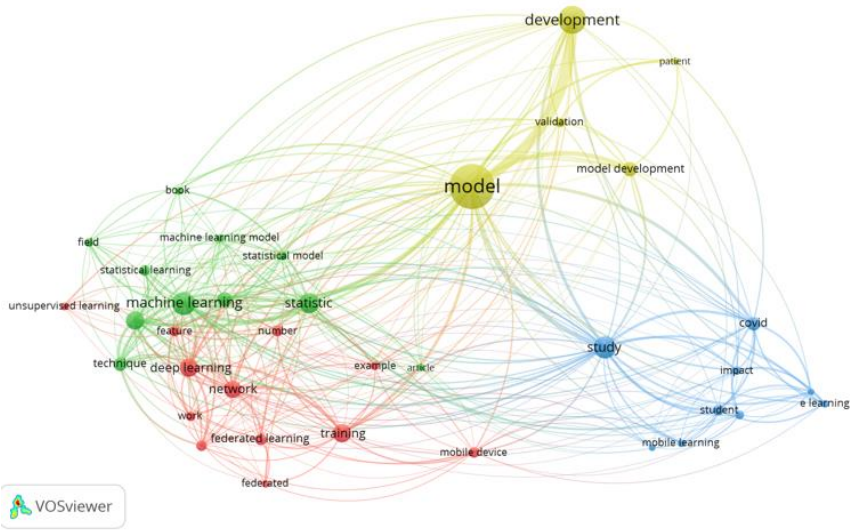

Fig. 1. Network Visualization of 37 Items with 4 Cluster

Cluster 1 is marked in red, and the words included in this cluster tend to be about "Mobile device", "deep learning", "federate learning", and so on. Cluster 2 is marked in green, and the words included in this cluster tend to be about "statistical learning", "statistical", "machine learning", and so on. Cluster 3 is marked in blue, with words included in this cluster tending to be about "mobile learning", "e-learning", and so on. Cluster 4 is marked in yellow, with words included in this cluster tending to be about "model", "development", "validation", and so on.

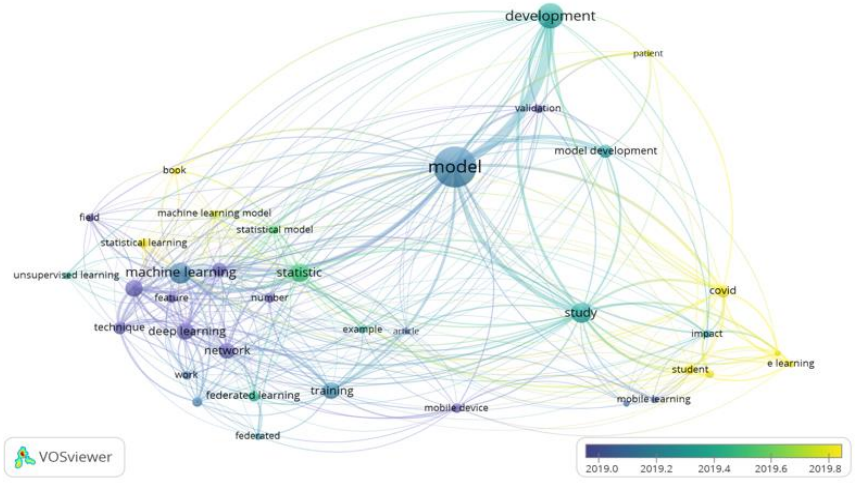

Fig. 2. Overlay Visualization of 37 Items with 4 Cluster

In figure 2 of vos viewers displays the latest research related to mobile learning, it can be seen that in 2019 there are many studies related to mobile learning in learning. The yellow color indicates research conducted in 2021. Color shows indicate research conducted in 2020. While the blue color indicates research conducted in 2019. From the overlay, it can be seen that research on mobile learning development has never been carried out on statistical learning.

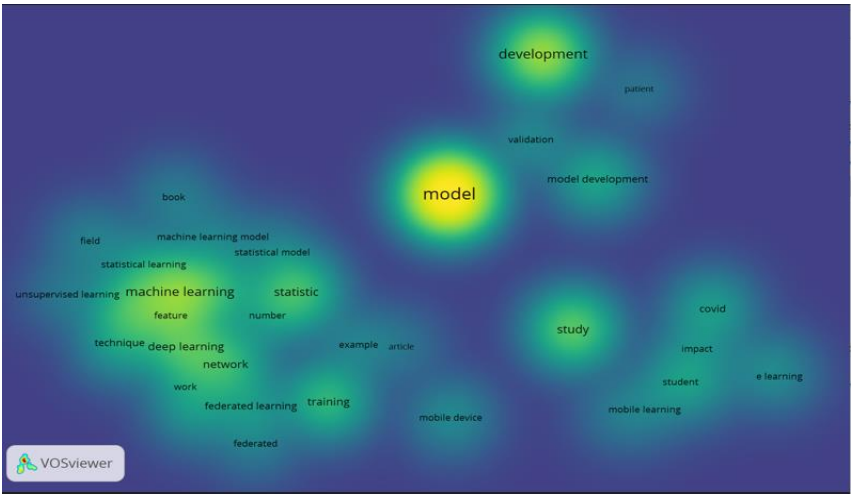

Fig. 3. Density Visualization of 37 items with 4 Cluster

The objects that are part of the cluster will be seen on the density visualization screen, as seen in Figure 3. The color of each object will change based on its density at that particular moment. The dark hue suggests that a lot of research has been done in 2020 and below, while the light color shows that research can still be conducted in 2020 and above to seek for current findings.

From the image analysis of the vos viewer display, the word "Mobile learning" has not appeared often, meaning there are not many. and becomes the latest when associated with statistical learning both in terms of teaching and learning media.

Mobile learning has become a popular alternative utilized by educators. It allows students to learn solely through the use of their smartphones, providing them with the opportunity to access educational materials anytime and anywhere. On the other hand, teachers can upload files, teaching materials, engage in discussions, and students can learn and work on assignments with the assistance of electronic and online resources.[4]. The study conducted at the Department of Computer Science, FST University of Nusa Cendana, focused on developing Mobile learning in Human-Computer Interaction (HCI) courses. The research findings led to the following conclusions:

1. Students in HCI courses already possess learning media models for Mobile learning, created through the creative efforts of the instructors using Information and Communication Technology (ICT). These media models can process, pack-

age, and present visual materials, audiovisuals, and interactive quizzes. Such learning media models effectively address the academic learning objectives of HCI.

2. The validation results from design experts, materials, learning media, one-to-one learner tests, small group tests, and field tests regarding the eligibility, acceptance, and usefulness of Mobile learning in HCI courses were overall excellent. This indicates that the development of Mobile learning in HCI courses at the Department of Computer Science, FST University of Nusa Cendana, has successfully enhanced the understanding and skills related to HCI[12].

To enhance the quality of mobile learning, developers should consider conducting maintenance and repairs. This would enable them further to improve the value and usefulness of mobile learning. Additionally, involving more stakeholders in the process can help developers gain insights and perspectives from different parties. This can be achieved by collaborating with developers with expertise in programming languages or consulting with professionals experienced in creating software for mobile learning. Moreover, developers must have a comprehensive understanding of developing mobile learning compatible with various operating systems found on mobile devices.[13]. The field of mobile learning holds great potential for future research. Existing literature encompasses diverse approaches, theories, and practices in this area. To facilitate comprehension for new researchers, it would be beneficial to explore and establish connections between these definitions, approaches, theories, and actual instances of mobile learning practices. This would contribute to a better understanding of the current landscape in the field of mobile learning.[14]

To address this urgency, educators, researchers, and institutions should prioritize the exploration of mobile learning in statistics education. By conducting more studies and sharing best practices, the field can benefit from evidence-based strategies and pedagogical approaches that leverage mobile technology effectively. Additionally, funding agencies and educational policymakers should support initiatives that promote the integration of mobile learning into statistics education.

By bridging the gap between statistics education and mobile learning, educators can potentially improve learning outcomes and engage students more effectively. The sooner efforts are made to explore and implement mobile learning in statistics education, the sooner students can benefit from this innovative approach. Some schools and universities started offering courses only on statistics. Statistics education is an interdisciplinary area that focuses on the teaching and learning of statistics. We examine some of the significant developments in tertiary statistics instruction in the next section.[15] [16] The revolution in assessment has played a significant role in the restructuring of statistical education by providing new avenues for understanding and recording student learning. Since the primary goal of assessment is to enhance student learning, it is imperative that all statistical instructors familiarize themselves with new assessment concepts, procedures, and methods. They should also carefully consider how they can assess student learning and outcomes for the specific course they are teaching. Technology has had a significant role in enhancing student learning statistics and will continue to do so. However, thoughtful preparation and deliberate use of technology are just as important as creativity and excitement. [17] on research

[18] statistical education and provide instructors with a set of guidelines for producing new and effective teaching materials. The summarized recommendations incorporate many of the innovations used in various classes of today's successful statistics. This review is supplemented by a collection of online resources related to statistics currently available on the Web.[19] We argue that simulation can be a very effective learning tool to help students understand abstract concepts associated with repetitive random processes. Standard software packages can be useful as can custom-designed software such as applets. Learning statistics is very important for students and to facilitate in the digital era, mobile learning is needed as a learning medium that is the latest.

4 Conclusion

Game-based learning is a rapidly growing field of research, with a significant number of recent and relevant articles published in recent years. The field is characterized by a diverse range of perspectives and approaches, with researchers investigating a variety of topics related to game-based learning, including its effectiveness in improving Articles on mobile learning media in physics learning are obtained through Publish or Perish software and analyzed through VOSViewer software. Based on the data obtained, articles titled "mobile learning" and "statistical learning" began to increase rapidly in 2019-2023. In addition, there are 4 classification clusters with 66 items using VOSViewer software. Reviewing the cluster, research on the application of mobile learning in statistical learning is still rarely carried out. Based on the development of publications regarding the application of mobile learning in learning.

Therefore, applying mobile learning in statistical learning can support the development of 21st-century technology. Mobile learning can help improve student achievement. This is because shorter content in multi-media formats that can adapt to students' learning styles is provided, along with a concentration on more narrowly focused subjects. Students can concentrate more on enhancing learning achievement with this learning strategy since they can acquire knowledge more quickly and conveniently. Based on the results of VOSViewer that has been shown for other research recommendations, namely by conducting research on the application of mobile learning.

References

1. J. R. Saffran, “Words in a sea of sounds: The output of infant statistical learning,” *Cognition*, vol. 81, no. 2, pp. 149–169, 2001.
2. J. Fiser and R. N. Aslin, “Encoding multielement scenes: statistical learning of visual feature hierarchies.,” *J. Exp. Psychol. Gen.*, vol. 134, no. 4, p. 521, 2005.
3. O. N. Lalian, E. Siregar, and M. Winarsih, “The effects of using realia media on increasing science learning outcomes of elementary school students: A meta-analysis,” in *Proceedings of the 2019 7th International Conference on Information and Education Technology*, 2019, pp. 1–4.

4. L. Pebriantika, B. Wibawa, and M. Paristiowati, “Adoption of Mobile Learning: The Influence And Opportunities For Learning During The Covid-19 Pandemic.,” *Int. J. Interact. Mob. Technol.*, vol. 15, no. 5, pp. 222–230, 2021.
5. İ. Göksu and B. Atici, “Need for mobile learning: technologies and opportunities,” *Procedia-Social Behav. Sci.*, vol. 103, pp. 685–694, 2013.
6. M. O. M. El-Hussein and J. C. Cronje, “Defining mobile learning in the higher education landscape,” *J. Educ. Technol. Soc.*, vol. 13, no. 3, pp. 12–21, 2010.
7. L. F. Motiwalla, “Mobile learning: A framework and evaluation,” *Comput. Educ.*, vol. 49, no. 3, pp. 581–596, 2007.
8. Y.-S. Chen, T.-C. Kao, and J.-P. Sheu, “A mobile learning system for scaffolding bird watching learning,” *J. Comput. Assist. Learn.*, vol. 19, no. 3, pp. 347–359, 2003.
9. N. J. Sheikh and O. Sheikh, “Forecasting of biosensor technologies for emerging point of care and medical IoT applications using bibliometrics and patent analysis,” in *2016 portland international conference on management of engineering and technology (PICMET)*, IEEE, 2016, pp. 3082–3093.
10. M. W. Ajinegara and J. Soebagyo, “Analisis Bibliometrik Tren Penelitian Media Pembelajaran Google Classroom Menggunakan Aplikasi VOSViewer,” *JNPM (Jurnal Nas. Pendidik. Mat.*, vol. 6, no. 1, pp. 193–210, 2022.
11. J. A. R. Valiente, “A Bibliometrics and Text Analytics Review of Games and Gamification in Education,” in *Handbook of Research on the Influence and Effectiveness of Gamification in Education*, IGI Global, 2022, pp. 23–45.
12. D. Prasetyo, B. Wibawa, and D. N. Musnir, “Development of mobile learning-based learning model in higher education using the addie method,” *J. Comput. Theor. Nanosci.*, vol. 17, no. 2–3, pp. 911–917, 2020.
13. E. Siregar and D. Aswan, “Mobile Learning With Case Study Methods For Civic Education In Elementary School,” in *International Conference on Innovation in e-ISSN*, 2022, p. 2870.
14. N. O. Keskin and D. Metcalf, “The current perspectives, theories and practices of mobile learning.,” *Turkish Online J. Educ. Technol.*, vol. 10, no. 2, pp. 202–208, 2011.
15. J. B. Garfield and I. Gal, “Assessment and statistics education: Current challenges and directions,” *Int. Stat. Rev.*, vol. 67, no. 1, pp. 1–12, 1999.
16. J. Garfield and B. Chance, “Assessment in statistics education: Issues and challenges,” *Math. Think. Learn.*, vol. 2, no. 1–2, pp. 99–125, 2000.
17. B. Chance, D. Ben-Zvi, J. Garfield, and E. Medina, “Technology innovations in statistics education,” *Technol. Innov. Stat. Educ*, vol. 1, no. 1, 2007.
18. S. Tishkovskaya and G. A. Lancaster, “Statistical education in the 21st century: A review of challenges, teaching innovations and strategies for reform,” *J. Stat. Educ.*, vol. 20, no. 2, 2012.
19. B. Chance and A. Rossman, “Using simulation to teach and learn statistics,” in *Proceedings of the Seventh International Conference on Teaching Statistics*, Citeseer, 2006, pp. 1–6.