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# How Microlearning Can Benefit Education: A Study of Factors and Trends in the Use of Microlearning

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**Abstrak**

Pembelajaran mikro (microlearning) menjadi salah satu pendekatan yang semakin diminati dalam dua dekade terakhir seiring dengan meningkatnya kebutuhan pembelajaran fleksibel dan berbasis teknologi digital. Penelitian ini bertujuan untuk mendefinisikan konsep pembelajaran mikro serta mengidentifikasi tren penelitian dan faktor yang mendorong pelaksanaannya. Metode yang digunakan adalah analisis bibliometrik terhadap publikasi bertema microlearning yang diperoleh dari basis data ScienceDirect sejak kemunculan awal istilah tersebut hingga tahun 2024. Analisis dilakukan berdasarkan tiga aspek utama, yaitu frekuensi publikasi, jumlah kutipan, serta jejaring ko-kemunculan dan kepenulisan bersama. Hasil penelitian menunjukkan adanya peningkatan signifikan dalam jumlah publikasi terkait pembelajaran mikro selama dua dekade terakhir. Publikasi dengan kutipan tertinggi sebagian besar berasal dari periode pra-pandemi COVID-19, sementara 99% dokumen tidak menunjukkan pola kolaborasi kepenulisan yang kuat. Selain itu, pembelajaran mikro didefinisikan melalui tiga faktor utama, yaitu penggunaan perangkat seluler, keterhubungan sosial, dan keterbatasan waktu. Temuan ini menegaskan bahwa penelitian mengenai pembelajaran mikro tetap relevan dan berpotensi menjadi landasan penting bagi pengembangan strategi pembelajaran digital di masa depan.
**Kata Kunci:** Faktor, Microlearning, Analisis Bibliometrik, Pendidikan, Tren

***Abstract***

*Microlearning has become one of the approaches that has become increasingly in demand in the last two decades along with the increasing need for flexible and digital technology-based learning. This research aims to define the concept of microlearning and identify research trends and factors that drive its implementation. The method used is a bibliometric analysis of microlearning-themed publications obtained from the ScienceDirect database from the initial appearance of the term until 2024. The analysis was carried out based on three main aspects, namely the frequency of publications, the number of citations, and the network of co-emergence and co-authorship. The results of the study show a significant increase in the number of microlearning-related publications over the past two decades. The publications with the highest citations were mostly from the pre-COVID-19 pandemic period, while 99% of documents did not show a strong pattern of authorship collaboration. In addition, microlearning is defined through three main factors, namely mobile device use, social connectedness, and time constraints. These findings confirm that research on microlearning remains relevant and has the potential to be an important foundation for the development of digital learning strategies in the future.*
***Keywords:*** *Factors, Microlearning, Bibliometric Analysis, Education, Tren*



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## INTRODUCTION

Microlearning or microlearning has begun to emerge significantly in the world, especially after the Covid-19 pandemic. With the many uses of technology by people in their daily lives, it is hoped that education can also adapt to take advantage of microlearning approaches. Learning in today's era must be able to combine technology with adaptability in the learning process, because one of the important aspects in improving the quality of education is to involve technology in the learning process (Al Husaeni et al., 2022). Microlearning can be identified from the learning content provided in small pieces, focused content segments, has a high potential in increasing student engagement in learning.

Several studies provide an idea that microlearning can effectively lower dropout rates and increase academic success. It should also be noted that learning using a microlearning approach can fill gaps or ignorance of learners in the content of formal lessons in the (traditional) classroom, which can improve their final exam results (Martinho, 2023). This can be closely related to education in Indonesia, where academic institutions in Indonesia want their students to be able to survive and improve their learning outcomes.

Other research shows that microlearning can increase students' motivation and their interest in learning. Microlearning can be likened to a "supplement" in learning, where the supplement can increase students' motivation and interest in learning a material (Zamata-Aguirre et al., 2023). This is in line with a discovery, which focuses on the need for microlearning in Indonesia high school education, which results that microlearning can provide a variety of services to meet the needs of students and teachers and the learning process, especially in the context of learning United Kingdom (Sugiarto, 2023). Another finding says that microlearning can effectively improve student retention and learning outcomes with independent learning and personalized learning (Rizky, 2023). The potential of using microlearning approaches in learning in Indonesia in reducing cognitive burden and improving student learning outcomes, especially at the higher education level (Sathiyaseelan, 2024).

Microlearning, which is considered quite effective in learning, is something that needs to be considered by other researchers and educators such as teachers or lecturers in integrating it into learning. Therefore, this study aims to further provide attention to trends in the use of microlearning and what drives the microlearning activities, so that later other researchers can see how important microlearning is in learning. Bibliometric analysis is one of the effective methods in finding research trends and has been widely used in various other aspects.

## RESEARCH METHODOLOGY

This study uses bibliometric data from articles published from the beginning of the keyword "microlearning" appearing until 2024 and indexed by ScienceDirect. Data collection was carried out by exporting the articles into *.ris format for data mapping using the VOSviewer application. Once the data is obtained, the VOSviewer application is used to visualize the data in the form of a network of previously collected data, to build a scientometric network that highlights productivity. The theme "microlearning" OR "micro learning" is used as a keyword for data search. According to Al Husaeni et al. (2022), the stages of bibliometric analysis in this study can be seen more clearly in Figure 1.

The first stage is to prepare tools and materials. This first stage is important to carry out bibliometric analysis (Al Husaeni et al., 2022). Several applications must be prepared first, namely a browser that has opened Science Direct to search and collect aricle data based on the keywords that have been selected, and the VOSViewer application for data visualization and data mapping.

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The second stage is data collection, where data is collected based on carefully determined keywords. The publication sought is the publication of search result articles with the keyword “microlearning” OR “micro learning” on the ScienceDirect website. The data found with these keywords starts from 1976 to 2024.

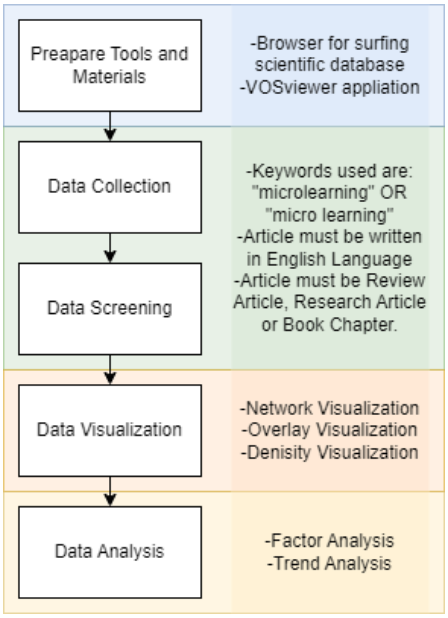


**Figure 1. Flowchart of Bibliometric Analysis**

The third stage is by conducting data screening, because the data that has been collected cannot be processed or analyzed directly. Therefore, the filtering of the data that has been collected is carried out at this stage. Data filtering is carried out by looking at two things: the article must be in English, and the article is a research article, a review article and a book chapter. After the screening stage was carried out, 155 article were collected.

The fourth stage involves data visualization using VOSviewer on 155 articles that have been screened. 155 articles is then exported into *.ris format and then uploaded into the VOSviewer application to be visualized in the form of network mapping visualization. There are three types of visualizations in VOSviewer, namely network visualization, overlay visualization, and density visualization.

The last or fifth stage is the data analysis stage, where at this stage analyzes the visuals that have been presented by VOSviewer and will be explained further in the “Result and Discussion” section.

## RESULT AND DISCUSSION

### Consideration When Applying Microlearning

Microlearning has emerged as a transformative educational approach that capitalizes on the principles of brevity and focus, allowing learners to engage with content in manageable segments. Its application in educational settings necessitates careful consideration of various factors to ensure its effectiveness and alignment with pedagogical goals. This synthesis will explore the critical considerations when applying microlearning in education, drawing on a range of scholarly sources. One of the primary considerations in implementing microlearning is understanding its pedagogical foundations. Microlearning is not merely about shortening content but involves a strategic approach to enhance learning outcomes through focused, bite-sized learning experiences. According to, microlearning's attractive format enhances learner focus and minimizes distractions, making it an effective tool for modern education (Samala, 2023). Alias emphasizes the need for

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educators to explore the pedagogical aspects of microlearning, suggesting that its design should be informed by educational theories and practices to maximize its impact (ALIAS, 2023). This indicates that educators must be well-versed in pedagogical strategies to effectively integrate microlearning into their curricula.

Moreover, the context in which microlearning is applied plays a significant role in its success. highlight that microlearning has been particularly effective in health professions education, where it has been shown to improve performance and safety in clinical environments (Gagné et al., 2019). This suggests that the specific educational context whether it be health, language, or another field should guide the design and implementation of microlearning strategies. further supports this by discussing the potential of microlearning in English language teaching, indicating that its application can vary significantly across different educational contexts (Barus, 2023). Therefore, educators must consider the unique characteristics and needs of their learners when designing microlearning interventions. Another critical consideration is the technological infrastructure required to support microlearning initiatives. The rapid advancements in technology have facilitated the rise of microlearning, allowing for the creation of engaging, interactive content that can be accessed anytime and anywhere (Kohnke, 2021). However, warns that educators must optimize microlearning materials for mobile learning to ensure accessibility and engagement (Kohnke, 2021). This necessitates an understanding of the technological tools available and how they can be effectively utilized to deliver microlearning content. Additionally, the integration of gamification and multimedia elements can enhance the learning experience, as noted by , who discuss the diverse contexts in which microlearning can be applied, including gamified formats (Sankaranarayanan et al., 2022).

Furthermore, the design of microlearning content itself is paramount. Effective microlearning modules should be concise, focused on specific learning objectives, and relevant to the learners' prior knowledge (Beste, 2021). This aligns with the findings of, who emphasize the importance of structuring microlearning experiences according to established instructional design principles, such as Gagne's Nine Events of Instruction (McNeill & Fitch, 2022). By adhering to these principles, educators can create microlearning experiences that are not only engaging but also pedagogically sound. In addition to content design, the timing and frequency of microlearning interventions must be carefully considered. Microlearning is often most effective when spaced out over time, allowing for reinforcement and retention of information (Janssen et al., 2023). This is particularly relevant in the context of self-paced learning, where learners can engage with content at their own convenience, as highlighted by (Adeoye, 2024). The flexibility of microlearning allows educators to accommodate diverse learning paces and styles, which can enhance overall learner satisfaction and engagement. Moreover, the assessment of learning outcomes in microlearning environments presents unique challenges. Traditional assessment methods may not adequately capture the effectiveness of microlearning strategies. Therefore, educators should consider implementing formative assessments that align with microlearning objectives, as suggested by , who discusses the importance of knowledge transfer in project-based organizations through microlearning (Beste, 2021). This approach can provide valuable insights into learner progress and inform future instructional decisions.

The role of learner autonomy in microlearning is another critical consideration. Microlearning encourages self-directed learning, allowing students to take control of their educational journeys (Kumar et al., 2022). This autonomy can foster greater motivation and engagement, as learners are empowered to explore topics of interest at their own pace. However, educators must also provide adequate support and guidance to ensure that learners do not feel overwhelmed or lost in the process. This balance between autonomy and support is essential for maximizing the benefits of microlearning. Additionally, the cultural and social dynamics within educational settings can influence the effectiveness of microlearning. As noted by , microlearning and microteaching can address the diverse needs of learners in cross-cultural contexts, promoting inclusivity and accessibility (Sergeyevich et al., 2021). Educators should be mindful of these dynamics and strive to create microlearning experiences that resonate with all students, taking into account

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their backgrounds and learning preferences. Finally, continuous evaluation and iteration of microlearning strategies are vital for long-term success. The educational landscape is constantly evolving, and what works today may not be effective tomorrow. Therefore, educators should engage in ongoing research and reflection to assess the impact of their microlearning initiatives and make necessary adjustments. This aligns with the findings of , who emphasize the importance of monitoring and evaluating student activity in microlearning courses (Javorcik et al., 2023). By fostering a culture of continuous improvement, educators can ensure that their microlearning efforts remain relevant and effective.

In conclusion, the application of microlearning in education requires a multifaceted approach that considers pedagogical foundations, contextual factors, technological infrastructure, content design, timing, assessment, learner autonomy, cultural dynamics, and continuous evaluation. By addressing these considerations, educators can harness the full potential of microlearning to enhance learning outcomes and engagement in diverse educational settings.

**Factors that Drives Microlearning**

In the monograph Microlearning in the Digital Age: The Design and Delivery of Learning in Snippets, chapter two in the monograph attracts the author's attention. The second chapter is titled “What is microlearning? Origin, Definition, and Applications” written by Carla Torgerson (2021) explains the origin of microlearning, what factors encourage microlearning to occur and the reasons for microlearning in education. In the chapter, Carla mentioned that there are three factors (see Figure 2) of society that can encourage microlearning. These three factors are bottom-up and learners driven which means attention to the active role of learners in the learning process.

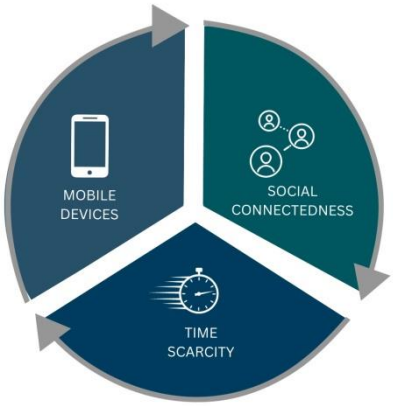


**Figure 2. Flywheel of the factors that drive microlearning**

Mobile Devices, is one of the driving factors for microlearning, it can be said that nowadays everyone has at least one or two mobile phones that have internet access. What happens when we need new knowledge and need it quickly? Of course, mobile phones are its mainstay in exploring the knowledge we want to seek. Torgerson (2021) said that in the context of education, the activity of seeking knowledge on the internet is an activity to consume micro-knowledge. When the continuous use of mobile phones and the internet is carried out to find and support our daily activities, why not also do it to support learning.

Social Connectedness tells the story that humans can learn from other humans, the difference is that with today's technology, the learning process of fellow humans can be done easily and quickly. Instead of asking the person next to me, where I don't know if he or she has the answer I want, I have wider access by looking for experts on the internet. I can even discuss with the expert through technology. Just like in the world of cabaret acting, if I need knowledge about cabaret, instead of asking people around me, where they may not understand it, I can ask the experts directly or get materials made by the instructors on the internet.

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Time Scarcity focuses that in microlearning, time is the key to seeking knowledge. Nowadays, especially adults are full-time with work, students are already filled with learning activities at school and fill their free time doing assignments from school. Then, how do you get everyone who struggles to spend one to three hours learning something? Of course, with microlearning, the learning sought will always be short and focused. Short here does not mean that it is not good, but it is to streamline the existing material to be distributed in a short time. Focus means that in the short material, we only learn what is discussed in the material. If we study material A, then what we get is A without discussing other irrelevant things. If we combine these three factors, mobile devices that are often used every day, easy access to the internet and the need for a short time to learn new things, then we have the perfect combination to create microlearning activities.

**Publication Frequency on Microlearning**

**Figure 3** shows that research related to microlearning has increased every decade, with the most significant increase occurring in 2010. This can also be strengthened by the existence of the Covid-19 pandemic, where from 2019 to 2024, research on microlearning is increasingly in demand. In 1970 - 2009 publications only had a total of 13 articles, while from 2010 - 2019 the total publications reached 38 articles, after the pandemic, namely 2020 - 2024 publications reached 104 articles. This can be triggered by the rise of technology and the intensity of the use of digital tools in schools and universities, and it is felt that the role of technology is one of the keys to improving education (Ghavifekr & Rosdy, n.d.; Laleno, 2019).

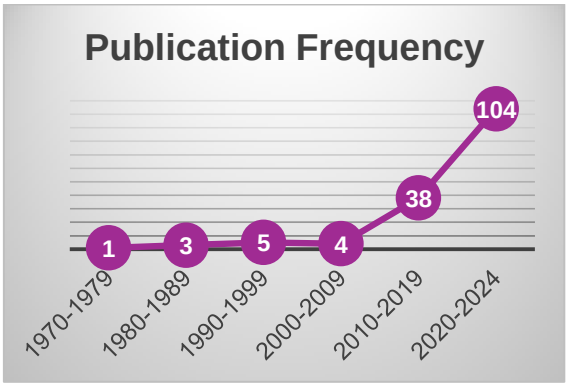


**Figure 3. *Line chart* of publication frequency from 1970 – 2024**

**Microlearning Trends By Number Of Citations**

Table 1 shows that the article created by Huang et al. has the article with the most citations, namely 1478 citations (Huang et al., 2015). It can also be seen that the three articles with the highest citations were published before the Covid-19 pandemic, so that the publications carried out post-covid refer to the three articles. The post-covid article with the highest citations was achieved by Xu et al. (Xu et al., 2020) with a total of 167 citations.

**Table 1. Research Citation Data in *Microlearning Topics***

| No | *Cites* | *Author(s)* | Article Title | Year | Journal |
|---|---|---|---|---|---|
| 1 | 1478 | Huang et al. | Trends in extreme learning machines: A review (Huang et al., 2015) | 2015 | Neural Networks |
| 2 | 1278 | Garud et al. | Bricolage versus breakthrough: distributed and embedded agency in | 2003 | Research Policy |

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| | | | | | |
|---|---|---|---|---|---|
| | | | technology entrepreneurship (Garud et al., 2003) | | |
| 3 | 293 | Garud et al. | Contextualizing entrepreneurial innovation: A narrative perspective (Garud et al., 2014) | 2014 | Research Policy |
| 4 | 167 | Xu et al. | Effects of teacher role on student engagement in WeChat-Based online discussion learning (Xu et al., 2020) | 2020 | Computers & Education |
| 5 | 141 | Cusmano et al. | Catching up Trajectories in the Wine Sector: A Comparative Study of Chile, Italy, and South Africa (Cusmano et al., 2010) | 2010 | World Development |
| 6 | 100 | Nikou et al. | Mobile-based assessment: A literature review of publications in major referred journals from 2009 to 2018 (Nikou et al., 2018) | 2018 | Computers & Education |
| 7 | 100 | Singh et al. | A survey of E-learning methods in nursing and medical education during COVID-19 pandemic in India (Singh et al., 2021) | 2021 | Nurse Education Today |
| 8 | 89 | Egidi et al. | The emergence of path-dependent behaviors in cooperative contexts (Egidi et al., 1997) | 1997 | International Journal of Industrial Organization |
| 9 | 87 | Zhu et al. | A multi-constraint learning path recommendation algorithm based on knowledge map (Zhu et al., 2018) | 2018 | Knowledge-Based Systems |
| 10 | 84 | Meyer et al. | Research on women with substance use disorders: Reviewing progress and developing a research and implementation roadmap (Meyer et al., 2019) | 2019 | Drug and Alcohol Dependance |

**Co-occurences dan Co-authorship Analysis**

Co-occurrences analysis is an analysis based on the number of occurrences of an event or phenomenon with a high frequency (Li et al., 2024). The occurrence or phenomenon taken in this study is the occurrence of keywords, the frequency of occurrence of keywords can be assisted by visualization from VOSviewer. Each co-occurrence analysis is presented in the form of relationships between nodes, as shown in **Figure 4** (Network Visualization), **Figure 5** (Overlay visualization) and **Figure 6** (Density Visualization).

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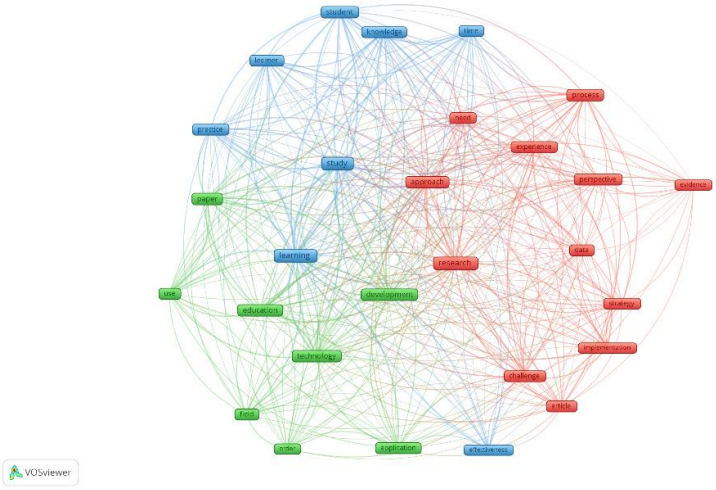


**Figure 4.** ***Network visualization*** **in** ***microlearning***

**Figure 4** shows a visual form of the relationship between keywords that frequently appear in 155 articles that have been found in the data search stage. The keywords shown in **Figure 4** are limited to a minimum of 10 occurrences in each article, so that 28 keywords are obtained, from these 28 keywords are grouped into 3 clusters or categories. Category 1 in red has keywords: approach, article, challenge, data, evidence, expereince, implementation, need, perceptive, process, research and strategy. Category 2 in green has keywords: application, development, education, field, order, paper, technology and use. Category 3 in blue has keywords: effectiveness, knowledge, learner, learning, practice, student, study and time.

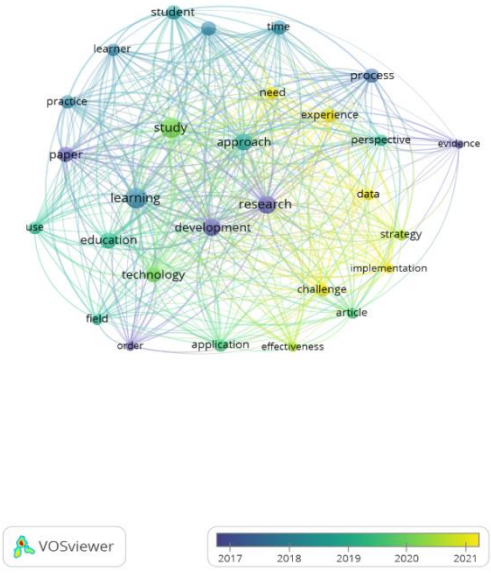


**Figure 5.** ***Overlay Visualization*** **in** ***microlearning***

In **Figure 5**, Overlay Visualization can produce the year that the keyword began to appear frequently from the beginning of the emergence of microlearning content in the 1970s to 2024. Some of the keywords that have recently emerged (in the last three years) are: need, experience, data, implementation and challenge.

In **Figure 6,** a density visualization is given which tells that the more often the keyword is used in the article, the larger and more luminous the surrounding area will be.

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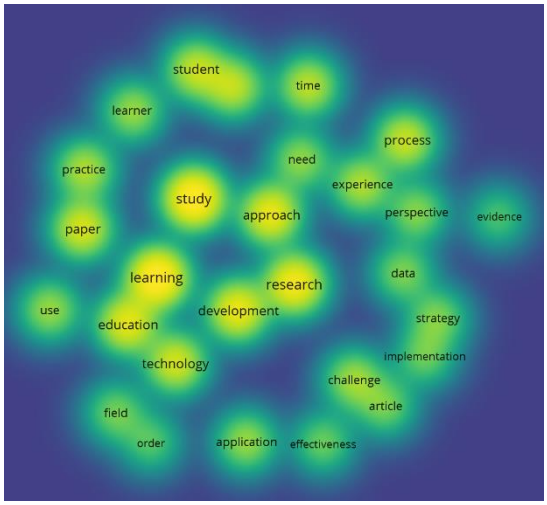


**Figure 6.** ***Density visualization*** **in** ***microlearning***

In this study, an analysis was also carried out on anyone who contributed to microlearning research by looking at the number of documents published by one or more authors. **Figure 7** shows the number of authors with their publications on microlearning, but after finding only one co-authorship has two documents, and two are the most documents on microlearning while other authors have only one document.

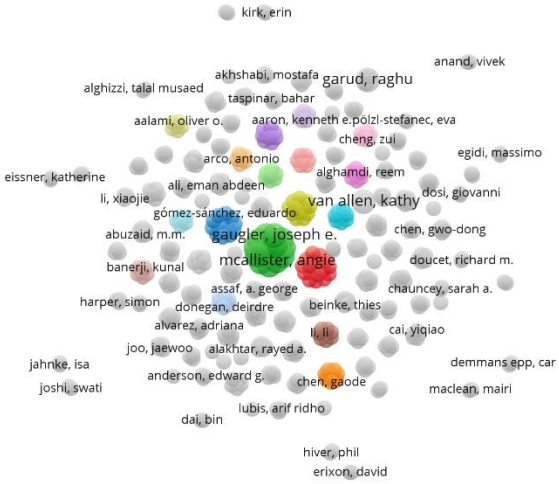


**Figure 7.** ***Network visualization*** **on** ***co-authorship***

One of the primary advantages of microlearning is its ability to enhance learner engagement through succinct and focused content delivery. Research indicates that microlearning can effectively cater to diverse learning styles and preferences, allowing for a more personalized learning experience (Sankaranarayanan et al., 2022) .For instance, highlight the adaptability of microlearning across different contexts, such as corporate training and language learning, demonstrating its versatility as an instructional method (Sankaranarayanan et al., 2022). This adaptability is crucial in educational settings where learners may have varying degrees of prior knowledge and different learning objectives.

Moreover, the design of microlearning modules is critical to their success. Effective microlearning should incorporate clear learning objectives, engaging content, and interactive elements that promote active learning (Wigati et al., 2023). The design process must also consider the cognitive load imposed on learners' study on an English for Specific Purposes (ESP) program illustrates how microlearning can reduce cognitive load, thereby facilitating better retention and understanding of vocabulary. This reduction in cognitive load is

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particularly beneficial in complex subjects where learners may struggle to assimilate large amounts of information at once. The implementation of microlearning also requires careful consideration of the technological tools available. The rise of mobile devices has transformed how microlearning is delivered, allowing learners to access content anytime and anywhere (Wigati et al., 2023). This flexibility is a significant advantage, as it enables learners to engage with material in a manner that fits their schedules and lifestyles. However, educators must ensure that the technology used is accessible and user-friendly to maximize participation and engagement. The integration of multimedia elements, such as videos and interactive quizzes, can further enhance the learning experience by catering to different sensory modalities.

The continuous evolution of microlearning necessitates ongoing research and adaptation. As the educational landscape changes, so too must the strategies employed by educators. The annual growth rate of publications related to microlearning underscores its increasing relevance and the need for educators to stay informed about best practices and emerging trends. This commitment to continuous improvement is essential for ensuring that microlearning remains an effective and engaging educational strategy.

## CONCLUSION

This study intends to get definitions and trends for research with microlearning keywords in the year this keyword began to appear until 2024 (the year this article was made). The method used is bibliometric analysis with five stages, namely: (1) Preapare tools and materials, (2) Data Collection, (3) Data Screening (4) Data Visualization and (5) Data Analysis. The factors of microlearning itself is a short material by paying attention to three factors: (1) mobile devices, (2) Social Connectedness, and (3) Time Scarcity which means that how often mobile devices are used daily, easy access to the internet and the need for a short and flexible time to learn new things or pursue lessons, then we have the perfect combination to create a microlearning activity. In the discovery of trends, it was carried out by looking at three factors, namely (1) publication frequency, (2) number of citations, and (3) co-occurrence and co-authorship analysis. In the first factor (frequency of publications), it was found that in the last two decades, research on the theme of microlearning has become more and more frequent, so other researchers are not wrong if they research with the theme of microlearning today. The second factor (the number of citations) is that 10 citations were mostly obtained by publications in the year before the covid-19 pandemic, therefore there is nothing wrong if the references used by researchers after the covid-19 pandemic refer to these references. As for the third factor (co-occurrence and co-authorship analysis), the results were obtained that microlearning keywords are divided into three categories in the appearance of at least 10 keywords in the article, and there are also five keywords that often appear in the last four years (2021 – 2024), namely: need, experience, data, implementation and challenge. In the contribution of the most authors, it turned out that it was not obtained, because there was only one authorship connection that produced only two documents, this indicates that out of 155 articles published in this study, 154 articles do not have the same author. The main purpose of this study is to help other researchers when researching in microlearning field. We recommend and even broader search on other scientific databases to even validate this study.

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