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**RESEARCH TRENDS ON TECHNOLOGY
INTEGRATION IN TEACHING WRITING TO EFL
LEARNERS FROM 2013 TO 2023:
A BIBLIOMETRI ANALYSIS**

Putri Anisa Rahmi

UIN Mahmud Yunus Batusangkar

putrianisarahmi@gmail.com

Rita Erlinda

UIN Imam Bonjol Padang

ritaerlinda@uinib.ac.id

Abstract: The rapid development of technology has greatly influenced human life. If utilized properly, technology will bring something positive. The positive development of technology is evident in its applications in education. The use of media or technology in the EFL classroom is very helpful for students, especially in learning writing. Many schools have implemented technology in writing instruction with the hope that it can help students overcome their writing difficulties. This study aims to analyze the development of research trends on the topic of Technology Integration in Teaching Writing to EFL Learners in the last 10 years (2013-2023). This research follows the structure of a bibliometric analysis study with data sourced from the Scopus database taken from 2013-2023 and conducts bibliometric analysis by using the VOSviewer application. This study found that the most research on technology in teaching writing was in 2021 with a total of 7 scientific publications. The most research conducted is in the form of articles and the country with the most scientific publications is China. Based on the mapping results using VOSviewer, five clusters were found. From the analysis, it was found that the keywords teaching, students, e-learning, and technology were the most discussed topics.

Keywords:

*Technology, teaching writing, language learning,
bibliometric analysis*

A. INTRODUCTION

Technology integration is widely understood to be the intentional use of any type of contemporary technology in language instruction. Integration is the presence of established and scheduled ICT, whereas technology indicates the use of tools, programs, and platforms without the primary goal of learning a second language (L2). Learning occurs as a result of unintended use (Abdu, 2018). With its rapid development, technology should also be used in education. The way students learn languages is greatly influenced by the various advances in technology that are being incorporated into education as new teaching methods. By using the interactive platforms, like tablets, smartphones, internet and PCs, ICT may promote students engagement, create more productive and entertaining classes, improve learning effectiveness, and encourage students in class.

Technology has been widely used in educational context, it has played a significant role in language instruction since 1960s and advancements in technology have resulted in numerous educational innovations and modifications (Liang, 2021). Due to its accessibility and affordable for education, technology for teaching have grown more and more popular all over the world (Jie & Sunze, 2021). By using technology in language teaching and learning, teachers and as well students can have a great chance to learn something new and gain more experience in learning (Merzifonluoğlu & Gonulal, 2018). Especially in English as a Foreign Language (EFL) class, when teacher can encourage students by using audio and video materials, online resources, emerging multimedia software and other into the classroom. Teacher can also make their own video materials, audio, or other depending on their need (curriculum or learning objectives) to encourage more students to learn.

There are a lot of considerations on the impact of technology, especially in mobile. Mobile learning is the term used to describe the usage of mobile devices in the teaching and learning process (Nariyati et al., 2020). Mobile learning has the potential to change the way that all courses are taught. Due to its adaptability and flexibility, teachers and students can attend and participate in lessons at any time and any place (Mussa & Sazalli, 2021). Also stated by (AlShareef, 2018), Mobile is refer to as type of distance learning; it has Wi-Fi, is portable, and refers to the suitability of language teaching and learning, including audio and mobile effects aiding in the acquisition of English language skills; which is a major language in technology and communication systems. The rapid spread of mobile devices, especially smartphones, has led to their greater use in education, resulting in the development of a new field called Mobile Assisted Language Learning (MALL) (Klimova, 2019).

Using mobile learning to motivate students is a good thing, especially when it comes to writing, and it would be even better to take the advantages of it (Sakkir et al., 2021). (Maulida et al., 2022) states that of the four language skills, writing is regarded as the most difficult and also takes the longest to practice and master it.

The writer need a clear understanding of the genre, not only for realistic editing and revision strategies, but also to be able to structure their writing in a contextually relevant way. However, it is mostly difficult for students to express their thought in writing in English. With the use of technology especially in mobile, students might be able to overcome such difficulties. Students can use the features offered to study writing, such as features to increase vocabulary, improve grammar, or produce texts, with the aid of a variety of related applications that are accessible online (Parra G. & Calero S., 2019).

Some of the advantages of using technology in teaching writing are, by using technology in teaching writing, it can improve students' writing process, students' writing ability, as well as gain an understanding of new literacy applications. It is also said that the use of technology in the writing classroom can encourage students to improve their writing ability in terms of quality and quantity (Yunus et al., 2013). Based on research from (Costley, 2014), by using technology and applications to assist the writing process, it can help students in improving vocabulary, spelling, and sentence structure. The use of technology such as computers and mobile phones as aids in learning grammar when writing is also much more motivating for students than the traditional writing process (Nomass, 2013).

Some studies have shown the impact of integrating technology in teaching writing to EFL Learners. There are (Dinc, 2019; Liang, 2021; Rintaningrum, 2023; Sharom & Kew, 2021) which conduct researches about the impact and benefit of using technology in teaching writing in the classroom. More research from (Kumar et al., 2022) which studied about the importance of technology. As well (Wahyuni et al., 2020) which studied about the kinds of technology used to facilitate language learning. (Başar & Şahin, 2022) also studied about the increase of research trends of MALL. Research by (Fuad & Suyanto, 2022; Rodríguez Jiménez et al., 2019) which studied about the research trends of educational technology and (Suprpto et al., 2021) which also studied about the research trends on TPACK.

All the Research above have shown the analysis of technology integration in teaching writing to EFL Learners and some other research about the use of research trends to see the increase number of studies for technology and MALL. However, so far, no studies have discussed or evaluated the increase of academic articles on the use of technology integration in teaching writing. Several studies related to the use of interactive learning technologies have been conducted by many researchers on technology-based foreign language learning in the classroom. The article recommendation can be made by providing a review that can present the technology trends that have been used in foreign language learning and their development over the past decade (2013-2023). Therefore, researcher will review and analyze the development of articles by using bibliometrics as an analysis in this study.

The bibliometric analysis is a suitable method to provide review of the research trends and the use of technology integration in teaching writing to EFL Learners.

Bibliometric analysis is a precise method of exploring and analyzing various volumes of scientific data to present the state of emerging trends in a topic or field of research (Donthu et al., 2021). The main objective of this study is to explore and analyze the large amount of scientific data from the Scopus database regarding the use of technology in teaching writing to EFL Learners between 2013 and 2023. This study is expected to reveal the developing trends in technology integration used in teaching writing. In order to implement the technology-based writing instruction for EFL Learners, the data from this bibliometric analysis study can be used as recommendations.

This study was conducted with the aim of helping educational researchers deepen their scope on the topic with the keyword "Technology in Teaching Writing". This research focuses on the research trend of "Technology Integration in Teaching Writing to EFL Learners on terms 2013-2023", this research is carried out based on the following research questions, namely as follows:

1. To what extent is the distribution of technology publication in Teaching Writing in the world?
2. What is the publication pattern of technology in teaching writing in 2013-2023?
3. What are the visualization results of the research trend of technology integration in teaching writing?

B. METHODOLOGY

The researcher used bibliometric analysis to carry out this study, with the aim of to generate a bibliometric and bibliographic review relevant to the new trends associated with the keyword "technology integration in teaching writing to EFL learners." This bibliometric methodology summarizes the use of quantitative methods (Donthu et al., 2021).

The present research follows the structure of bibliometric analysis study, as previously marked before that the articles use is from the Scopus database. Scopus was used as the source of data due to the wider range of publications (Echchakoui, 2020). The method use is the bibliometric analysis as its offers a quantitative understanding of the academic literature in many theory-related policies on various worldwide publications (Zahra et al., 2021). A bibliometric analysis is a mechanical method that interprets international research trends in a certain topic by using data from databases of scholarly publications. This method separates bibliometric analysis studies from review papers, which primarily meant to provide information about recent developments, difficulties, and potential future directions of a specific issue (Md Khudzari et al., 2018).

The keyword "technology integrating in teaching writing" was used as the filter to search titles, abstracts, and keywords from 2013 to 2023. The data collection was

conducted in April 2023 and there are 27 articles were obtained according to the criteria. The data consists of articles, conference papers and books from all over the world with the setting boundary of 2013-2023. The collected articles is saved in *.csv format which has previously downloaded from Scopus database. The data then processed by using VOSviewer to help visualize and analyze the trends in bibliometric form. By using VOSviewer, researchers can collect several data maps. VOS viewer can create publication maps, country maps, journal maps based on networks (co-citation); create keyword maps based on shared networks; and create maps with a very large number of items (Effendi et al., 2021). For further research, the data will be visualized in the form of bibliometric maps.

According to (Gillani et al., 2022; Van Eck & Waltman, 2023) ,data from prepared database sources can be mapped into 3 forms, namely:

- 1) Network Visualization

In this data map, items are marked with their labels in the form of circles. The size of the circle and the label of an item are denoted by the cluster weight. The higher the weight, the larger the circle label and vice versa. The lines between the items represent links or networks.

- 2) Overlay Visualization

Similar to network visualization, items are colored in a different way. There are two ways to color items in overlay visualization. Blue-colored ranges represent lighter weights while green or yellow represent heavier weights.

- 3) Density Visualization

There are two options for density visualization. One is item density visualization, followed by cluster density visualization. Similar to the density visualization, each item has a color that indicates its density. These colors range from blue (less) to green (normal) to yellow (high).

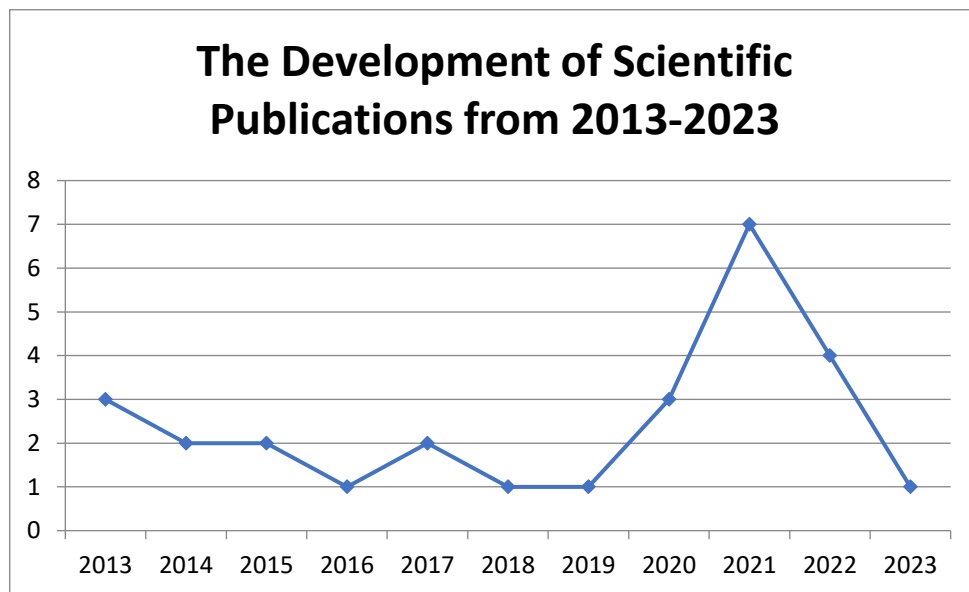
C. FINDING AND DISCUSSION

1. Analysis of Publication Trends or Publications Development of Technology Integration in Teaching Writing

In this section, the analysis on the development of the number of articles related to technology integration in teaching writing from 2013 to 2023 will be explained. After a careful search, 27 articles related to the keyword technology integration in teaching writing were obtained in the Scopus database from 2013 to 2023. It can be seen from Picture 1. The number of documents increased year by year in 2021, but suddenly decreased until 2023. There were about 7 articles in 2021 and decreased to 4 articles in 2022 and 1 article in 2023. Meanwhile, the second highest number was in 2013 at 3 articles, but the publication also continued to decline until 2017 and beyond.

Articles published in 2013 are (Hirata & Hirata, 2013; Mohamad et al., 2011; Pet et al., 2014). Articles published in 2014 are (Moratelli & DeJarnette, 2014;

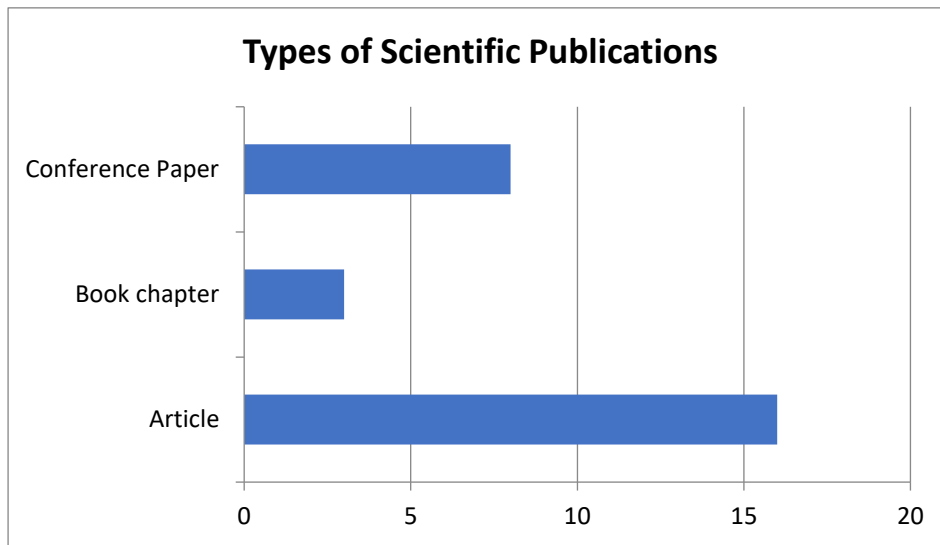
Sutherland et al., 2014). In 2015 several articles were published, which are (Balchin & Wild, 2015; Mazlan et al., 2015). Articles published in 2016 (Ynuus et al., 2016). Articles published in 2017 (Artyushina et al., 2017). Articles published in 2018 (Wiannastiti et al., 2018). Articles published in 2019 are (Osifo, 2019). There are several articles published in 2020, which are (Saienko, 2020; Ting, 2020; Wei, 2020). In 2021, several articles were also published, there are (Ahmed, 2021; Ebron & Mabuan, 2021; Kurt, 2021; Lv, 2021; Moli & Faqiang, 2021; Shafiee Rad et al., 2021; Wang, 2021). Articles published in 2022 are (Ayar, 2022; Janar & Uralova, 2022; Jing & Wang, 2022; Xu & Yao, 2022). And in 2023 an article was published (Muftah, 2023).



Picture 1. The Development of Scientific Publications from 2013-2023
Source: Microsoft Excel

2. Types of Scientific Publication of Technology Integration in Teaching Writing

This section will explain the results of analyzing the growth or development of scientific publications of articles with the keyword "technology integration in teaching vocabulary" in the last 10 years (2013-2023). With data that has been prepared well and carefully beforehand and has been indexed by Scopus, 27 scientific publications were obtained. From the data that has been obtained, then analyzed, the types of scientific publications that have been published over the past 10 years are obtained. The most common type of scientific publication is articles, namely 16 scientific publications, followed by conference papers as many as 8 scientific publications and 3 of them are book chapters.



Picture 2. Types of Scientific publications

Source: Microsoft Excel

3. The Publication Distribution of Countries in the World

This section explains the results of the analysis of the countries publication of scientific articles with the keyword Technology Integration in Teaching Writing obtained from Scopus data from 2013 to 2023 where there are 27 total articles from various countries. Based on the number of documents from various countries, China dominates the board with 5 articles from 2020 to 2022. Furthermore, Turkey also contributed to this topic with a total of 3 articles. Meanwhile, with the same number, Saudi Arabia, Iran, the United States, the United Kingdom, and Malaysia contributed 2 articles each. Other countries that also contributed to Technology Integration in Teaching Writing are Uzbekistan, Taiwan, Philippines, Ukraine, Hong Kong, United Arab Emirates, Indonesia, Russia, and Japan with a total of 1 article each.

Table 1. Publication Distribution of Countries (2013-2023)

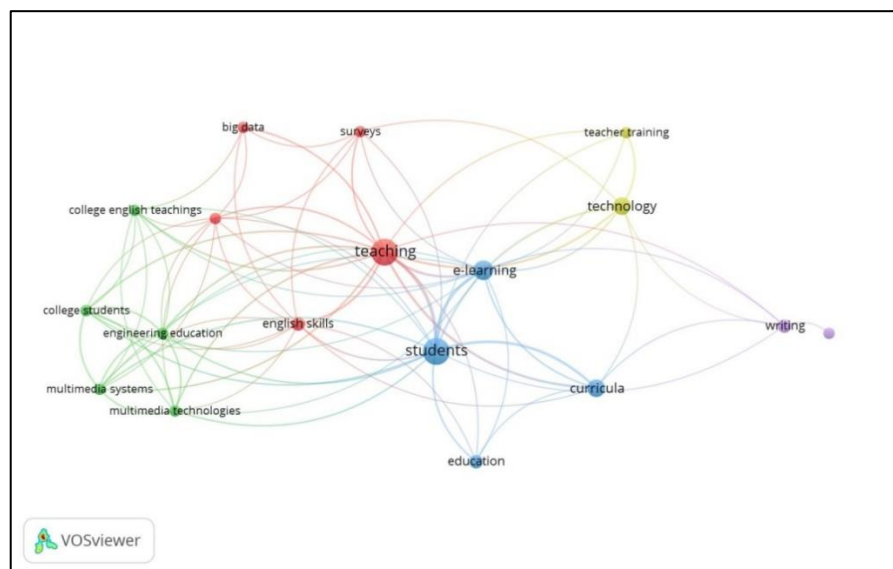
Countries	Number of Documents
China	5
Turkey	3
Saudi Arabia	2
Iran	2
United States	2
United Kingdom	2
Malaysia	2
Uzbekistan	1
Taiwan	1
Philippines	1

Ukraine	1
Hong Kong	1
United Arab Emirates	1
Indonesia	1
Rusia	1
Japan	1
Total	27

Source: Microsoft Excel

4. The Visualization of Technology Integration in Teaching Writing Topic Area Using VOSviewer

Based on 27 articles obtained with the keyword Technology Integration in Teaching Writing from the Scopus database from 2013-2023, the researcher visualized the research trends on this topic with the help of VOSviewer software. By using VOSviewer, data was obtained based on the Title and Abstract of 27 articles with the keyword Technology Integration in Teaching Writing. Some of the keywords found will be labeled with colored circles. From the results of the visualization map, a picture is obtained that can help to understand the pattern connection in the data. There are 3 different map visualizations that result from using and mapping with VOSviewer, namely network visualization, overly visualization, and density visualization. These three visualization maps will explain how the development of the research trend of Technology Integration in Teaching Writing.



Picture 3. The Network Visualization of the Articles
Source: VOSviewer 1.6.19

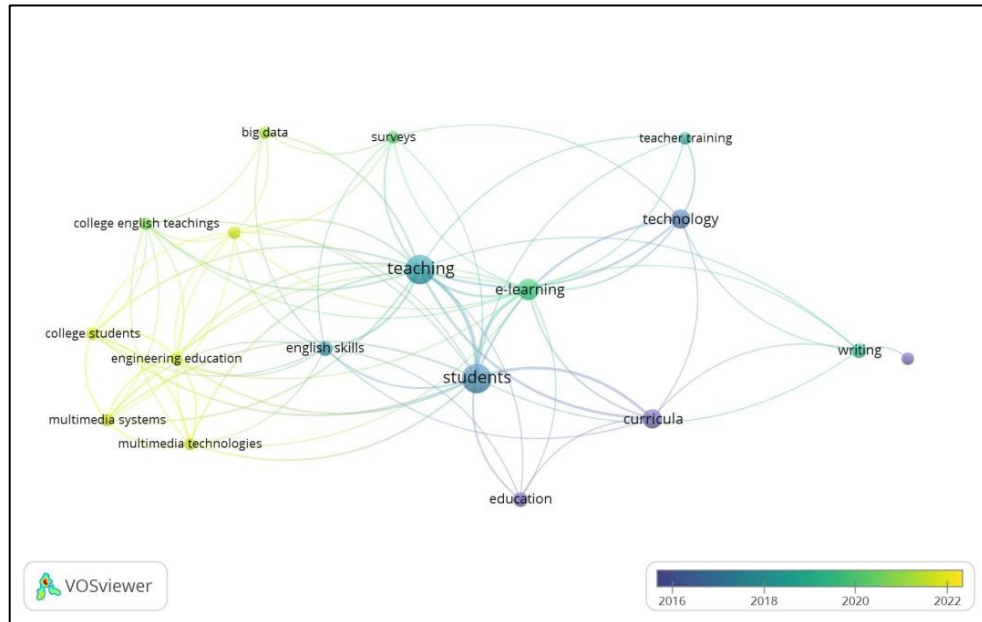
The first picture is a network visualization of the articles with the keyword Technology Integration in Teaching Writing. Network visualization focuses on the relationship between each keyword that appears in interconnected clusters. After the data was analyzed by using VOSviewer, about 5 clusters were obtained as shown in the map in *picture 3*. which consisted of various colors (Red, blue, green, yellow, and purple). For each item in the cluster, a circle of different sizes is formed. The size of this circle shows the positive relationship between the occurrence of keywords in the title and abstract of the article. The size of the letters and circles is determined by the frequency of occurrence (how many times the keywords appear in the article) (Mulyawati & Ramadhan, 2021).

The following are 5 clusters obtained from the identification results of VOSviewer mapping with the keyword Technology Integration in Teaching Writing along with the keywords obtained from each cluster:

- 1) Cluster 1 is indicated in Red, there are 5 items in the cluster with the dominant keywords appearing in this cluster, namely teaching, English skills, surveys, and big data. For cluster 1, the most dominant keyword is teaching. Teaching is also the most dominant issue in research at the moment which is also closely related to students, and e-learning.
- 2) Cluster 2 is indicated in Blue, where there are 4 items in the cluster with the dominant keywords being students, e-learning, curriculum, and education. For cluster 2, the most dominant keyword is students.
- 3) Cluster 3 is indicated in Green, where there are 5 items in the cluster with dominant keywords, namely college English teachings, college students, engineering education, multimedia systems, and multimedia technologies. In cluster 3, all keywords have the same issue/weight or have not been studied in depth in each of its parts.
- 4) Cluster 4 is indicated in Yellow, where there are 2 items in the cluster with dominant keywords, namely technology and teacher training. Technology is the most dominant issue studied in cluster 4.
- 5) Cluster 5 is indicated in purple, where there are 2 items in the cluster with the dominant keyword appearing is writing. It can be seen in the cluster that issues related to writing are still not widely researched and even far from other clusters.

This data shows the relationship between one topic and another. The thicker the line, the stronger the pair of topics or keyword areas. It can be seen from *picture 3*. Teaching, students, e-learning, and technology are the most dominant keywords in the cluster data. It can be concluded that, from the articles obtained in the range of 2013 to 2023, these 4 topics are the most frequently discussed by researchers. In addition, if a keyword/topic/node is found that has no relationship with other topics

or the line is still very thin, then this will potentially become a new research for future researchers. However, it is also important to consider whether the research is relevant and doable.

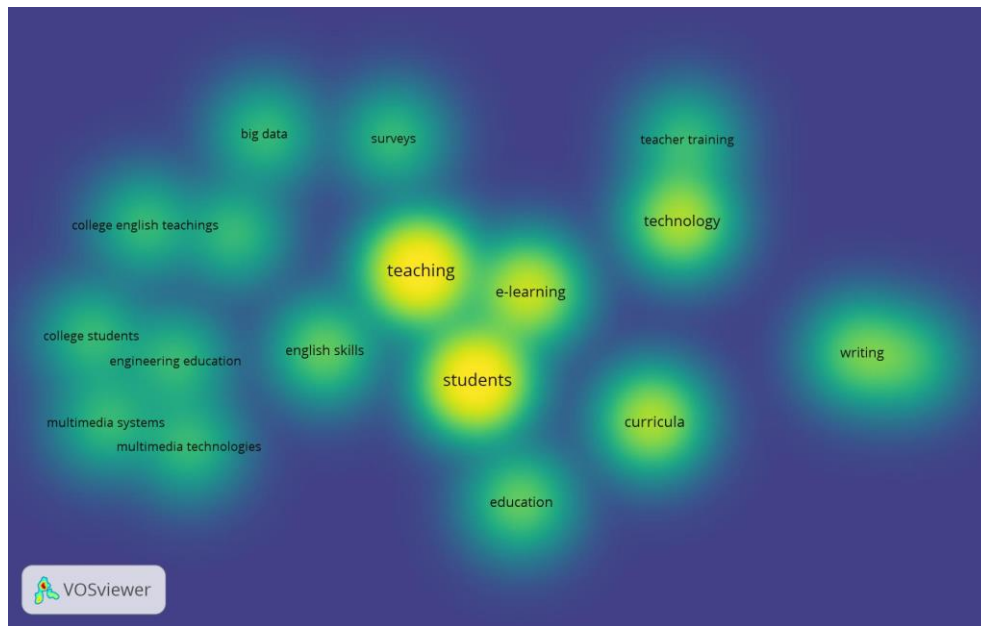


Picture 4. The Overly Visualization of the Articles
Source: VOSviewer 1.6.19

Meanwhile, *Picture 4.* presents a map that this time shows yearly data related to topics or keywords. This map can be referred to as an overlay visualization map that serves to explain data mapping about the time span or year of article publication and for density visualization. The colors of each topic in the map show the trend of the topic from year to year. It can be seen from the color bar located at the bottom right, the darkest color (dark purple) shows the period of 2016, followed by the period of 2018 (dark green), 2020 (light green), and the brightest color (yellow) which is 2022. From *Picture 4.* It can be concluded that the left area with a bright yellow color, with the keywords engineering education, college students, multimedia systems, and multimedia technologies is the latest trend that starts in 2022 and is in great demand by researchers.

However, if we look back based on the keywords, the relationship between teaching, writing and technology is still far from being researched. It can also be seen that in the 2020-2022 research year period, not so many studies on writing and technology were researched, as well as e-learning which began to be abandoned since the end of Covid-19. Researchers are currently more interested in researching engineering education, college students, multimedia systems and technology. Multimedia is listed as one of the research trends because multimedia-based teaching has only recently been taught and applied in education. There will be many

opportunities and research that can be done by researchers on the topic of multimedia, especially in relation to teaching writing.



Picture 5. The Density Visualization of the Articles
Source: VOSviewer 1.6.19

While in *Picture 5*. A map of Density visualization is shown that explains the novelty mapping of each keyword that appears in the picture. In the map, the depth of each topic studied is shown, which can be seen from the area around the topic or keyword. The darker/harder the color around the topic, the more researchers are doing research in that topic area. Teaching, students, and e-learning are topics that are quite widely covered by researchers. As for curriculum, technology and writing, there is still a lot of room for research development. It can be seen from the visualization available, where the color for curriculum, technology and writing, still looks dim. Researchers can consider the research space for technology and teaching writing, or the use of multimedia in teaching writing. How to apply multimedia technology in teaching writing can be further studied and interesting to be studied.

D. CONCLUSION

Based on the research findings and discussion, it can be concluded that the students' ability in writing introductory paragraph of cause and effect's essay is considered good. Most of the students had been able to fulfill the criteria of a good introductory paragraph of cause and effect's essay. The most common problem found in developing the introductory paragraph was that the students wrote a too broad thesis statement.

In carrying out this research, the researcher uses bibliometric methods to study the state of research in the field of "Technology Integration in Teaching Writing".

How the development of technology integration in teaching writing, identifying the main sources of published research papers (Scopus), countries with the most scientific publications, and interesting topics that are widely discussed in technology integration in teaching writing. The author points out some key points regarding research on technology integration in writing instruction during the period 2013-2023.

There are several points that can be taken from the research trend of Technology Integration in Teaching Writing to EFL Learners in the period of 2013-2023. With a total of 27 scientific publication articles, with the keyword Technology Integration in Teaching Writing, the number of publications increased from 2020 to 2021. The type of scientific publication data obtained is dominated by articles. While the country with the most publications of scientific articles related to topics or keywords is dominated by China. Whereas, from the results of the bibliometric analysis that has been carried out using VOSviewer, on Network Visualization, There are 5 clusters, with the most frequently discussed topics/keywords being Teaching, students, e-learning, and technology. While the one that has almost no relationship at all is performance (which is located next to writing). As for Overly Visualization, the most popular topics in 2022 and beyond are engineering education, college students, multimedia systems, and multimedia technologies. Density Visualization shows how many researchers are researching the topic, namely topics such as teaching, students, e-learning, curriculum, technology, and writing.

Research on technology integration in teaching writing is an important and influential topic in English language learning. The researcher hopes that this research can help other researchers to know the development of the study/research on Technology Integration in Teaching Writing to EFL Learners that have been carried out since 2013-2023. A little advice for future researchers is to examine more things regarding the topics that are rarely researched so that the scope of Technology Integration in Teaching Writing to EFL Learners can be expanded and produce more research and answers to any questions that exist.

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