



Research Trend of Inquiry Learning in Elementary School in the Last 10 Years: To Determine the Opportunities in the Future

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ABSTRACT

Inquiry Learning in Elementary School research has evolved in the last ten years, making it an interesting topic to research to understand the trends and developments of Inquiry Learning in Elementary School so that it becomes a research opportunity. This study aims to analyze research trends, researchers' contributions, and the most researched research topics on the topic of Inquiry in Elementary School in education over the past ten years and identify potential research topics related to Inquiry in Elementary School in Education in the future. This study uses the bibliometric analysis method using Google Scholar database and Software VOSviewer, where 138,000 articles were obtained. The results of the bibliometric analysis show that Inquiry Learning in Elementary School research has experienced a consistent decline in the last ten years. This becomes the next challenge, and opportunity for future research. Further research related to Inquiry Learning in Elementary School can be used and applied with a STEM-based approach namely Science, technology, engineering, and mathematics. This is because the stem-based Inquiry model can improve students' critical thinking and problem-solving skills. This study has limitations, namely only using one database, Google Scholar, to obtain research data. Therefore, it is recommended that Inquiry Learning in Elementary School research be carried out using other databases besides Google Scholar to obtain more extensive data.



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INTRODUCTION

Primary education is the initial stage in formal education that is very important in shaping students' character, skills, and basic abilities (Helda & Syahrani, 2022; Sondakh et al., 2022). In this digital and globalization era, basic education not only aims to acquire basic knowledge and skills, but also to develop 21st-century skills such as critical thinking, creativity, collaboration and communication skills (Borodzhieva, 2022; Chalkiadaki, 2018; Khan et al., 2022; Kuhlthau et al., 2015). One of the learning methods that can facilitate the development of these skills is Inquiry-Based Learning (IBL) (Bunwirat & Boonsathorn, 2018; Chu et al., 2021; Huijser et al., 2015; Thaiposri & Wannapiroon, 2015). IBL is a learning method that allows students to conduct independent investigation and exploration on specific learning topics (Aparicio-Ting et al., 2019; Petersen et al., 2020a). In this method, the teacher acts as a facilitator and students are responsible for organizing, conducting, and evaluating their learning process (Onyema et al., 2019).

Inquiry learning is a learning approach that emphasizes the active role of students in the learning process (Kalpana, 2014; Utaminingsih, 2022). Inquiry learning in elementary school is a learning approach that emphasizes the active role of students in the learning process (Asmawati & Bintang Kejora, 2020; Cleovoulou & Beach, 2019). Students are encouraged to ask



questions, investigate problems, and build knowledge through the inquiry process (Alam, 2022a; Ng, D. T. K et al., 2022; Rasyid et al., 2022). This approach is very effective in primary school education as it helps students develop critical thinking skills, problem-solving skills, and curiosity about the world around them (Agbi & Yuangsoi, 2022; Alam, 2022b; Dini, 2022).

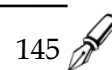
Inquiry learning is based on the idea that students learn better when they are actively involved in the learning process and have the opportunity to explore their own interests and questions (Ng, D. T. K et al., 2022; Pitvorec et al., 2022). This encourages students to take responsibility for their own learning and to develop a deeper understanding of the concepts being taught (Caskurlu et al., 2021). By engaging in inquiry-based learning, students become more independent learners and better at transferring their knowledge and skills to new situations (Al Mamun et al., 2020). Research has shown that inquiry learning is an effective approach in teaching students in elementary schools. Studies have found that students who engage in inquiry-based learning show higher levels of achievement, greater motivation, and better attitudes towards learning (Adhami & Taghizadeh, 2022). In addition, inquiry learning has been shown to increase students' abilities to think critically, solve problems, and communicate effectively (Kahar et al., 2022; Sari & Muchlis, 2022).

In the context of 21st-century education, where 21st-century skills such as critical thinking, collaborating, and communicating effectively are increasingly important, the inquiry learning approach in primary schools is becoming increasingly relevant (Chalkiadaki, 2018; Van Laar et al., 2020). Therefore, further research on inquiry learning in elementary schools is very important. This research can help improve the quality of learning, support competency-oriented curricula, foster interest in science, and increase student participation in class.

Many studies have been conducted to identify the effectiveness of the inquiry learning method in improving student skills, learning motivation, and learning outcomes in various subject areas. In addition, research also shows that teachers play an important role in the success of inquiry learning methods (Becker et al., 2020). Teachers need to have sufficient skills and understanding of inquiry learning methods in order to effectively implement them in the classroom (Onyema et al., 2019). Herefore, training and support for teachers are essential to develop their ability to implement inquiry learning methods (Budnyk, 2019; Oates, 2019). Although inquiry learning methods show positive results in improving students' skills, there are still some challenges that need to be overcome in implementing these methods in the classroom (Maatuk et al., 2022; Saija et al., 2022). Some of these challenges include limited time and resources, students' discomfort in learning through independent exploration, and lack of support from parents and communities (Geuze & Goossensen, 2021; Kukulska-Hulme et al., 2022). Therefore further research is needed to identify the factors that influence the effectiveness of inquiry learning methods and how best to overcome the challenges in implementing these methods in the classroom. In addition, educators and researchers need to collaborate to develop the resources and strategies needed to effectively implement inquiry learning methods in elementary schools.

Bibliometric analysis is a research method used to identify research trends, researchers' contributions, and the most researched research topics in a field (Lin et al., 2022). Through bibliometric analysis of recent research trends in the field of inquiry learning in primary schools in the last 10 years, we can understand publication trends, the most published journals, the most prolific authors, as well as the most researched research topics (Gao et al., 2021). Research trends on inquiry learning methods in primary education over the last 10 years are still missing. The novelty of this study is that it shows that this method is increasingly being researched and implemented in various elementary schools around the world. Research also shows that inquiry learning methods can improve students' concept understanding, reasoning skills, and communication skills.

This information can assist educators and researchers in enriching their knowledge about inquiry learning methods and basic education in general. In addition, bibliometric analysis can provide insights into future research trends and enable researchers and educators to identify



knowledge gaps that need to be investigated in the future (Tlili et al., 2022). In this regard, bibliometric analysis can help strengthen the argument about the importance of using inquiry learning methods in basic education and provide a foundation for further development in this field. Therefore, a mapping analysis of Inquiry Learning in elementary schools is needed. The purpose of this study is to conduct a literature review related to the topic of Inquiry Learning in elementary schools from 2012 to 2022 using bibliometrics analysis to determine the opportunities of Inquiry Learning in elementary schools in the future.

RESEARCH METHOD

This research uses quantitative methods with bibliometric analysis conducted using literature studies on the Publish or Perish database to see the distribution of article publication contributions. Bibliometric analysis is used to provide a broad understanding of the entire discipline (Yulianingsih et al., 2020). The bibliometric analysis method is carried out to see the visualization of publication trend mapping to evaluate the contribution of articles to the development of knowledge of various literary sources using statistical methods (Guo et al., 2019; Karakus et al., 2019). With bibliometric analysis, novelty and trends in research will be obtained (Suprpto, Kusnanik, et al., 2021).

This study focuses on the publication of indexed national journals using the Publish or Perish database. Publish or Perish is an alternative that provides a wide range of indexed literature reviews from various national reputable publishers based on the Google Scholar database. The source of metadata obtained from this research uses the Google Scholar database from 2012-2022. This writing data was taken on March 12, 2023. This research conducted a search with the Google Scholar database, obtained 138,000 articles ranging from 2012-2022 using the keyword "(Inquiry in elementary school)". The data obtained is stored in CSV format and then processed using Ms.Excel and VOSviewer to obtain bibliometric mapping. The following flow of this research is illustrated in Figure 1 (Ari Masitoh et al., 2021; Setyaningsih et al., 2018).

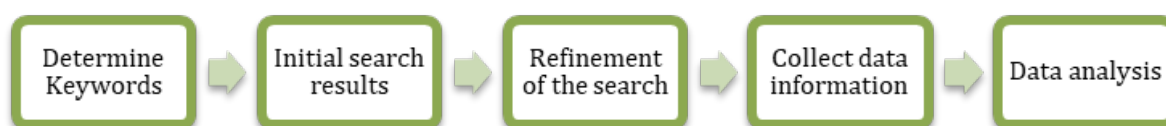


Figure 1. Five steps in performing a Bibliometric analysis (Dawana et al., 2022; Suprpto et al., 2021)

Figure 1 shows the author's data analysis process using the bibliometric analysis method. Data analysis is carried out by mapping the results of research trends with Vosviewer software to describe Co-Occurrence and collaboration between authors, relationships between documents, and related keywords according to research topics (Dawana et al., 2022). The analysis results of this study are based on network visualization and overlay visualization. The results of this visualization are analyzed to see the development of inquiry learning studies and its relationship with learning methods in elementary schools. As a result, this research can see how inquiry learning research products are used in learning in primary education schools.

RESULTS AND DISCUSSION

Based on the search findings from the google scholar database conducted using the keyword "Inquiry in elementary school" which resulted in a total of 138,000 articles published between 2012 and 2022, it can be concluded as follows: comma-delimited text files (.csv), which are then evaluated by utilizing VOSviewer. The software will produce results that will systematically sort which ones are most relevant to identify the keywords that have the highest level of relevance, as shown in Table 1.



Table 1. Top 10 Articles with Highest Relevance Google Scholar Database

RN	Document Title	Authors	Year	Source	Cited by
1	A multilingual and multimodal approach to literacy teaching and learning in urban education: A collaborative inquiry project in an inner city elementary school	BY Ntelioglou, J Fannin, M Montanera...	2014	Frontiers in ...	163
2	The effect of using simple aircraft concrete media on the mastery of concepts in inquiry science learning in elementary school students	E Asmawati, MT Bintang Kejora	2020	MUDARRI SA: Jurnal ...	26
3	The Effect of Three Levels of Inquiry on the Improvement of Science Concept Understanding of Elementary School Teacher Candidates.	IP Artayasa, H Susilo, U Lestari, SE Indriwati	2018	Internation al Journal of ...	31
4	Teacher collaborative inquiry in Ontario elementary schools: An analysis of provincial and school board policies and support documents	B Kutsyuruba, T Christou, L Heggie...	2015	Canadian Journal ...	12
5	... of Multimedia Assisted Inquiry Learning Methods on My Heroes' Theme of Critical Thinking Skills and Learning Outcomes of Class IV Students of Elementary School	Y Purwanita, Y Riyanto, T Suyanto	2019	Internation al Journal for ...	24
6	Improved application of the control-of-variables strategy as a collateral benefit of inquiry-based physics education in elementary school	L Schalk, PA Edelsbrunner, A Deiglmayr...	2019	Learning and ...	44
7	The elementary-school functioning of children with maltreatment histories and mild cognitive or behavioral disabilities: A mixed methods inquiry	W Haight, M Kayama, T Kincaid, K Evans...	2013	Children and Youth ...	33
8	Implementation of ethnoscience-based guided inquiry learning on the scientific literacy and the character of elementary school students	A Alim, S Sarwi, B Subali	2019	Journal of Primary Education	18
9	Targeted courses in inquiry science for future elementary school teachers	R Steinberg, Y Wyner, G B, S	2015	Journal of College Science ...	10
10	Qualitative inquiry on parental involvement in children's education: perspectives of parents, children, and teachers in select elementary schools in the Philippines	MA Jabar	2021	Asia Pacific Journal of Education	10

RN= Result Number

Table 1 is the result of searching the top ten most relevant articles on the research topic "Inquiry in elementary school" in the Google Scholar database. Of these ten articles, the article with the highest level of relevance is ranked first. These top ten articles are important references in examining the use of inquiry learning models at the elementary school level.

Based on the research that has been conducted on these ten articles, the inquiry learning model has been proven to be very effective in improving learning outcomes, critical thinking skills, and student learning motivation in elementary schools. Therefore, this research topic becomes very important to be researched further in the future. One of the studies that support the use of inquiry learning methods in elementary schools is research by (Andrini, 2016) which shows that the use of inquiry in learning can improve student learning outcomes and provide



opportunities for students to acquire critical thinking skills. In addition, according to research by (R. M. Sari et al., 2021) the use of inquiry learning models can increase student learning motivation and provide a more meaningful learning experience.

The importance of this research is in line with research from (Petersen et al., 2020b) which states that inquiry is an interesting learning approach for students and can help them acquire the knowledge and skills needed in everyday life. Therefore, research on the use of inquiry learning methods in elementary schools is becoming increasingly important and relevant to be conducted in the future.

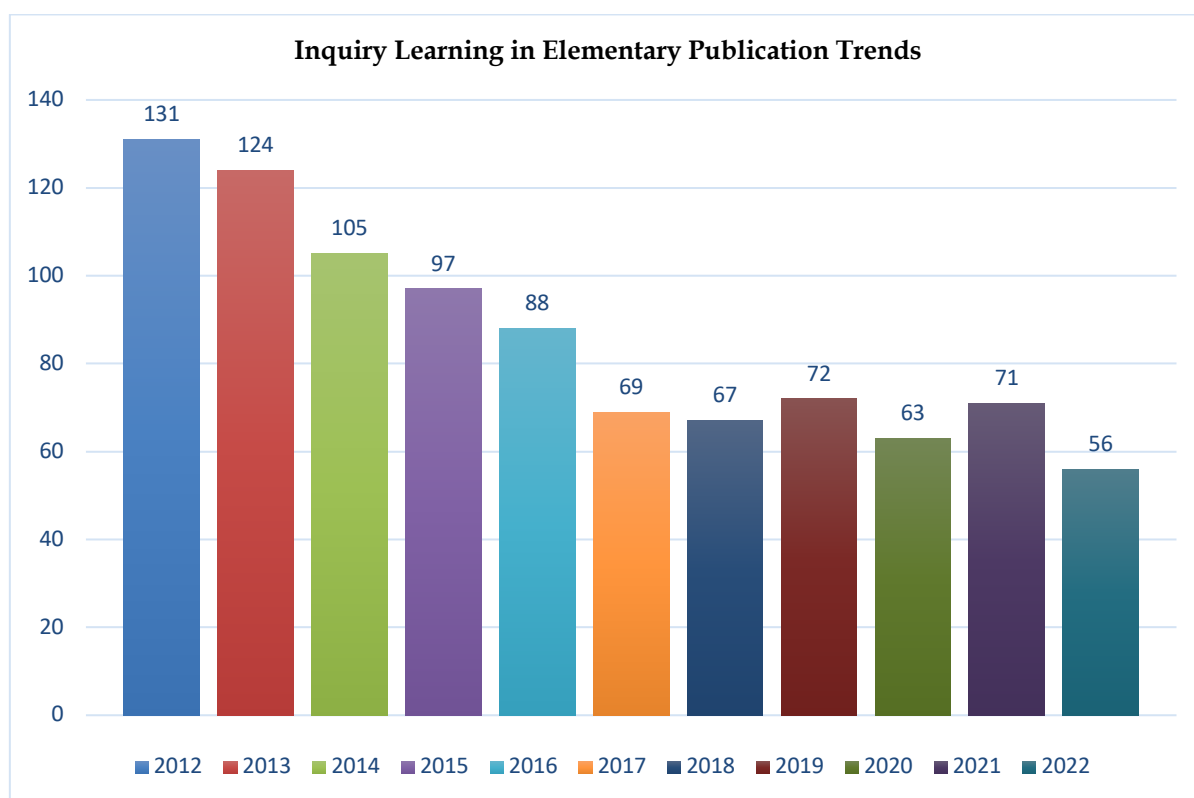


Figure 2. Number of Google Scholar Database publications of Inquiry Learning in Elementary School in the last Ten Years

Figure 2, which shows the research trends of inquiry learning in primary schools over the last 10 years, is an important indicator in identifying the developments and challenges in the field of inquiry learning at the primary school level. From the figure, it can be seen that there is a decline in the number of publications over the last 10 years, the data can be seen that from the years from 2012 to 2022. The graph of this data shows a downward trend in the number of publications from year to year. At first, the publications in 2012 were 131, then declined sharply in 2013 to 124, and continued to decline gradually until 2020, where the value reached its lowest point at 63. After that, there was a slight increase in 2021 to 71, but then fell again in 2022 to 56. In the graph, the gradual decline along with the decline in value from year to year, shows a consistent downward trend. This shows that inquiry learning in elementary schools is a challenge for future researchers to find out the extent of the inquiry learning model in elementary schools.

Although the number of publications on inquiry research in primary schools has decreased. However, this does not diminish the importance of research on inquiry learning in primary schools, which has great potential in improving learning outcomes, critical thinking, and willingness to learn in education. Previous research (Berie et al., 2022) also showed fluctuations in the number of publications in the same time period. Therefore, research on inquiry learning



In this context, research on inquiry learning in elementary schools is an interesting topic to be researched in the future, as there are still many unknowns and many outstanding research possibilities in this field. As a result, it can make a significant contribution to the field of education and improve the overall quality of learning in primary schools.

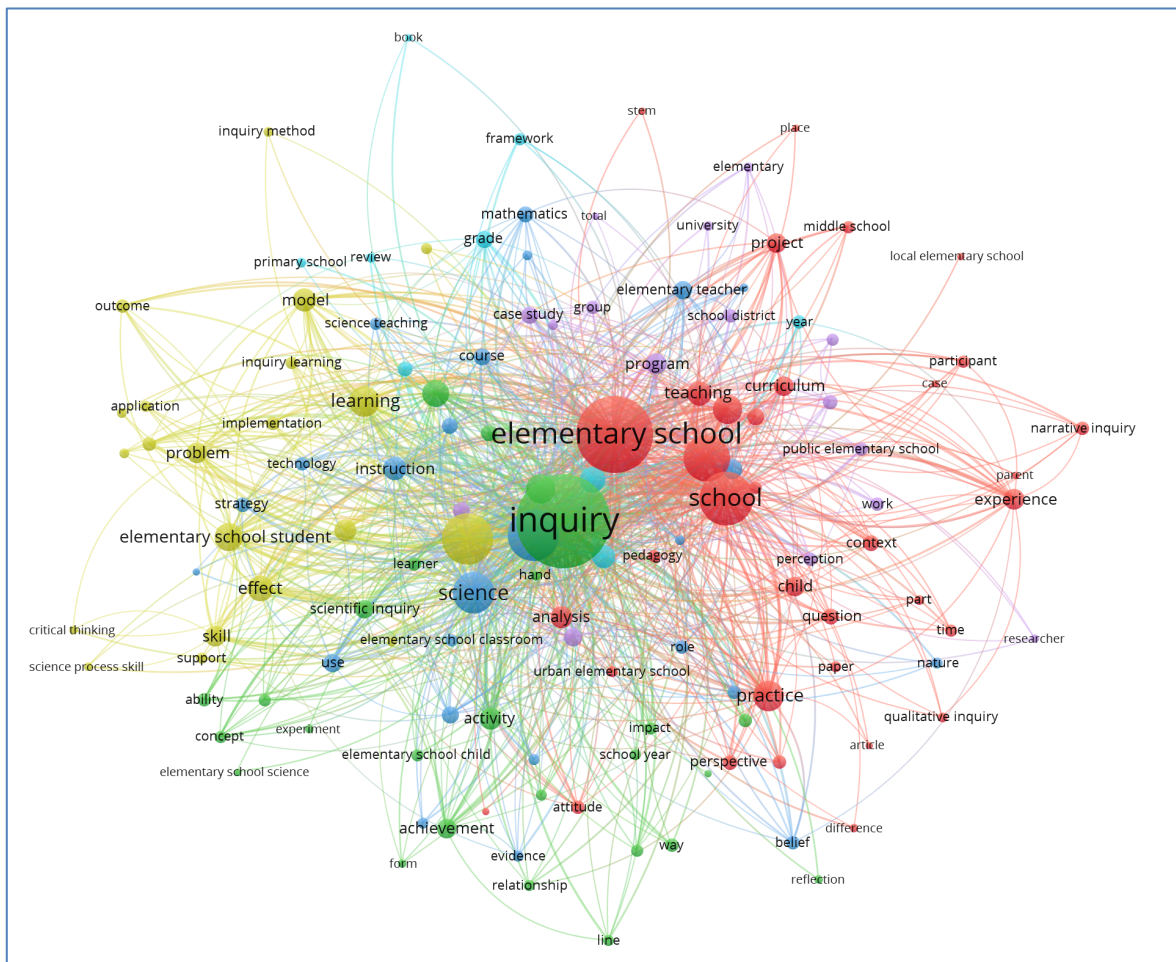


Figure 3. Mapping on Inquiry in elementary school science on the Google Scholar Database in the last ten years

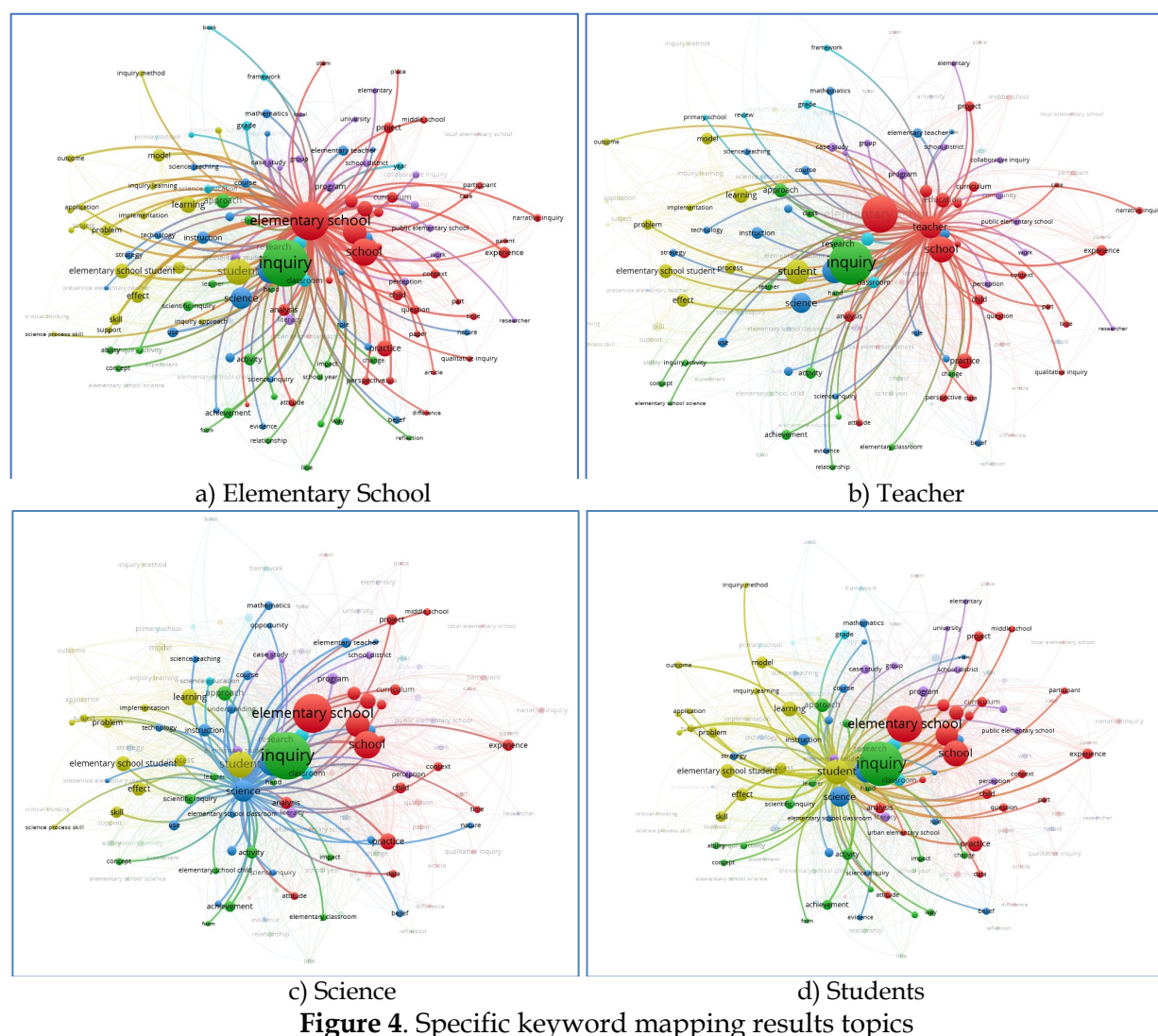


Figure 4 in this figure shows an example of the results of a more specific keyword mapping on Elementary School, namely Teacher, Science, and Students. In Figure 4a-b, it can be seen that the top trend of Inquiry research in elementary schools over the past 10 years has great potential to be further explored as the topic has a wide scope and is flexible in its application. In this case, the learning model can contribute to education through many aspects such as learning methods, projects, and STEM.

Then, if we look at Figure 4c-d, there is a pattern of multiple connections, this topic can also be explored further because Inquiry in primary schools can contribute and focus on curriculum and learning system and also inquiry learning can be project-oriented to gain experience in learning. For example, by utilizing Inquiry in primary schools in STEM education, we can improve learners' critical thinking skills (Baharin et al., 2018). Therefore, we can see that this topic has the potential to be developed further.

In this context, it is important to note that Inquiry research in primary schools can provide significant benefits to education worldwide. In this regard, the Inquiry approach can assist students in learning more abstract and complex concepts through more active and interactive methods (Tuma, 2021). In future research, further research into this topic can help identify the potential and limitations of the Inquiry approach in improving the quality of education around the world. Thus, we can see that this topic is not only relevant for education in primary schools, but also for the education system as a whole.

The recommendation for future research is to integrate the inquiry learning model in elementary schools with the STEM approach. Education in STEM (Science, Technology,

Engineering and Mathematics) in elementary schools has a very important role in preparing students for success in an increasingly connected and complex world (Hobbs et al., 2018). One way to facilitate effective STEM learning in primary schools is to adopt an inquiry learning approach (Chiu et al., 2015; McDonald, 2016). Inquiry learning allows students to be active agents in their learning process (Sherman & Teemant, 2021). Students are encouraged to ask questions, gather evidence, and build their own understanding of complex STEM concepts (Clark & Lott, 2017; Grangeat et al., 2021). In the context of STEM learning, inquiry also allows students to acquire critical thinking skills which are very important (Baharin et al., 2018).

Through inquiry learning, students can develop the ability to gather and evaluate information, estimate results, question assumptions, and make evidence-based decisions (Saputro et al., 2022). These critical thinking abilities are very important skills inside and outside the classroom, and can help students become more effective problem solvers in the real world (Agbi & Yuangsoi, 2022; Isiklar & Abali Öztürk, 2022). In addition, inquiry learning can also help students build confidence and interest in STEM fields (Ng, D. T. K et al., 2022). Through the inquiry process, students can have meaningful experiences and curiosity about the world around them. Therefore, utilizing inquiry learning approaches in STEM fields in primary schools can help improve students' critical thinking skills, support more effective learning, and help students build interest in STEM fields (Kareem et al., 2022). This will prepare students to improve their 21st century skills in the future, where critical thinking and problem-solving skills are becoming increasingly important.

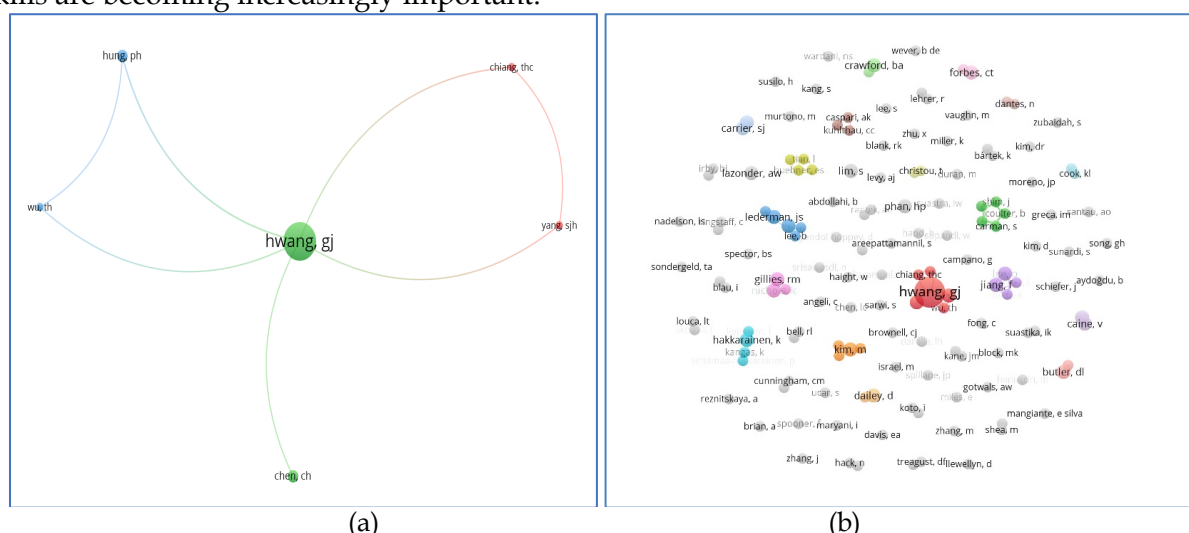


Figure 5. Based on the google scholar database, top author visualizations and overall author visualizations in database google scholar

There are 6 corresponding authors based on 147 authors found in the information for corresponding co-authors. Three clusters are depicted in Figure 5(a): green cluster with two authors, red cluster with two authors, and blue cluster with two authors. Based on the Google Scholar database, it can be seen that Hwang, GJ is the Top Author with a prominent visualization of a large Green circle in the middle of the topic Inquiry Learning in Primary Schools. Figure 5 (b) is a visualization without being limited by connections with each other. It can be seen that the Hwang, GJ cluster from National Taiwan University is the Top Author on this research topic in the Google Scholar database. This means that Hwang, GJ is a contributor to Inquiry Learning research in elementary schools in the national scope indexed by Google Scholar.

The limitation of this research is that it uses the Google Scholar database, so it can only visualize data from Google Scholar. It is recommended for further research related to the trend of inquiry learning in elementary schools using databases other than Google Scholar, for example, the Scopus database so that it can produce broader research trends.



CONCLUSION

Based on the results of bibliometric analysis and literature review, the following findings were obtained: The trend of Inquiry publication topics in elementary schools has decreased consistently in the last 10 years. This is a challenge for future research, whether there is an increase in research topics, because this inquiry learning topic has the potential to be researched in the future, especially at the level of education in elementary schools. Based on the research mapping, it is known that the trends of Inquiry research in elementary school in the last 10 years are: 1) focusing on education such as teaching curriculum, School, mobile learning, and STEM; 2) Focusing on learning approaches, such as technology, knowledge, mathematics, science, strategy, etc. 3) focusing on learning model outcomes such as science process skills, problems, and critical thinking.

The implication of this research is the discovery of several examples of novelty in the topic of Inquiry learning in elementary schools so that this research can be used as a reference for further research with Inquiry learning. This research can also find the most relevant articles related to Inquiry in elementary school on Google Scholar database and the authors who have the most significant relationship from each journal. Therefore, this research also limits future research trends that can develop on this research topic. This research recommends finding updates in the study of Inquiry in elementary schools in education by integrating STEM in education because the STEM-based Inquiry model will improve students' critical thinking skills and problem solving. The existence of this research can be used as a reference for further research on Inquiry in elementary schools. For further research related to Inquiry in elementary schools, it is recommended to be developed by utilizing other database sources besides Google Scholar

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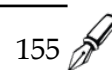
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