



## Bibliometric Analysis: Research Trends in Creative Thinking Behavior in Learning

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**ABSTRACT:** The ability to think outside the box, create something that has never existed before, and apply knowledge and skills creatively and inventively. Effective learning activities require a balance between several aspects, namely cognitive, affective, and psychomotor aspects. Creative thinking behavior is a manifestation of creativity, and creativity refers to the ability to generate new, unique ideas. Related to the importance of behavior on creative thinking, it is necessary to analyze the extent of the development of research on creative thinking behavior. Bibliometric analysis using Publish of Perish (PoP) and VOSviewer for the last 10 years (2014-2023) keyword "creative thinking behavior. The analysis took from the google scholar and scopus databases. Bibliometric analysis is a technique that is realized in 2 categories, namely performance analysis and science mapping. The results of the analysis are stored in a small database used in this study. Since this research only uses Google Scholar and Scopus databases, the research methodology of thinking behavior is also limited. The research results can be expanded by using alternative databases and keyword searches. This study may be useful for future researchers who want to investigate creative thinking behavior.

**KEYWORDS:** Bibliometric Analysis, Creative Thinking Behavior, Learning.

### INTRODUCTION

In Bloom's taxonomy, which was revised by Kratwohl, the dimensions were added to be knowledge and cognitive processes. (1). The position of creative thinking or creativity is at the evaluation level, which is part of the creativity stage. Creative thinking is included in the cognitive dimension. At this level, people not only have the ability to find the relationship of ideas and data, but also have the ability to create unique works, creative solutions, and new ideas (4). In Bloom's revised taxonomy, the highest level of creative thinking is at the level of creating. In this level, it is expected to be able to create something new, make innovative ideas, and show their creativity during the learning process. The ability to think outside the box, create something that has never existed before, and apply knowledge and skills creatively and inventively (1)(2)(3). In the process of effective learning activities, it requires a balance between several aspects that support each other, namely cognitive, affective, and psychomotor aspects (5)(6). In the learning process activities besides involving cognitive aspects also involve psychomotor aspects. The psychomotor aspect can be observed from the behavior carried out in the learning process. Behavior is one aspect that supports success in assessing the results of learning activities (7). So in creative thinking in addition to cognitive aspects, it is necessary to know the behavioral aspects during creative thinking.

The concepts of creativity and creative thinking are closely related to creative thinking behavior. Creativity is the basis of creative behavior, and there is a relationship between creativity and creative thinking. Creative thinking behavior is a manifestation of creativity, and creativity refers to the ability to generate new, unique, and valuable ideas. When a person behaves creatively, they use their creative abilities to make something new, unique, and innovative (8). Creative thinking is also the basis of creative thinking behavior, which includes the ability to see things from different points of view, generate alternative ideas, make unusual connections, and solve problems in creative ways (9). Creative thinking behavior relies on these creative thinking abilities, which allow people to go beyond convention and create unique solutions. There is a reciprocal relationship between creativity, creative thinking, and creative behavior, including creativity influencing creative thinking and creative thinking as the basis of creative behavior. A person who has a high level of creativity tends to have a tendency to think creatively, which in turn encourages them to behave creatively (10). On the other hand, practicing active creative thinking can also enhance and improve one's creative ability. Learning methods that encourage exploration, experimentation, and concept association and allow for different ways of thinking and expression can achieve this (11).



Related to the importance of behavior in creative thinking, it is necessary to analyze the extent of the development of research on creative thinking behavior. Therefore, it is necessary to conduct an assessment related to this matter which aims to see research trends on creative thinking behavior in a certain period of time. This study presents data using bibliometric analysis for creative thinking behavior research trends. Bibliometric analysis with the help of the Publish or Perish (PoP) and VOSviewer applications in the period set for the last 10 years (2014-2023) on digital data base sources. The analysis took from the Google Scholar and Scopus databases with a maximum limit of 500 publications. The results of this analysis are to get a description of the trend of research that has been done on creative thinking behavior and provide an explanation of the gaps or opportunities for research that can still be developed.

**METHOD**

The methods used in the study to achieve the objectives were bibliometric analysis and descriptive content analysis. Bibliometric analysis was chosen because it can describe the state of all research from the past to the present using various perspectives (12)(13)(14). The examination of statistical information and analysis of bibliographic elements of scientific publications is known as bibliometric (15). Based on this, the researcher used bibliometric analysis techniques with the aim of examining in depth all research to find trends and interrelationships with the theme of creative thinking behavior from a broad perspective through digital databases (6). The digital data base in this study comes from Google Scholar and Scopus with a period of 10 years (2014-2023). According to Dinçer (16), descriptive content analysis is used to look at research trends in critical thinking in mathematics more deeply and thoroughly. The purpose of this analysis is to reveal patterns of themes in frequencies or percentages to provide a broad picture of the case. However, this analysis does not allow for detailed conclusions to be made. Bibliometric analysis is a technique that is realized in 2 categories: performance analysis and science mapping. Performance analysis takes into account the contribution of the research, while science mapping focuses more on the relationship between the constituents of the research. The next sub-section highlights the techniques provided for performance analysis and science mapping (Figure 1) (17).

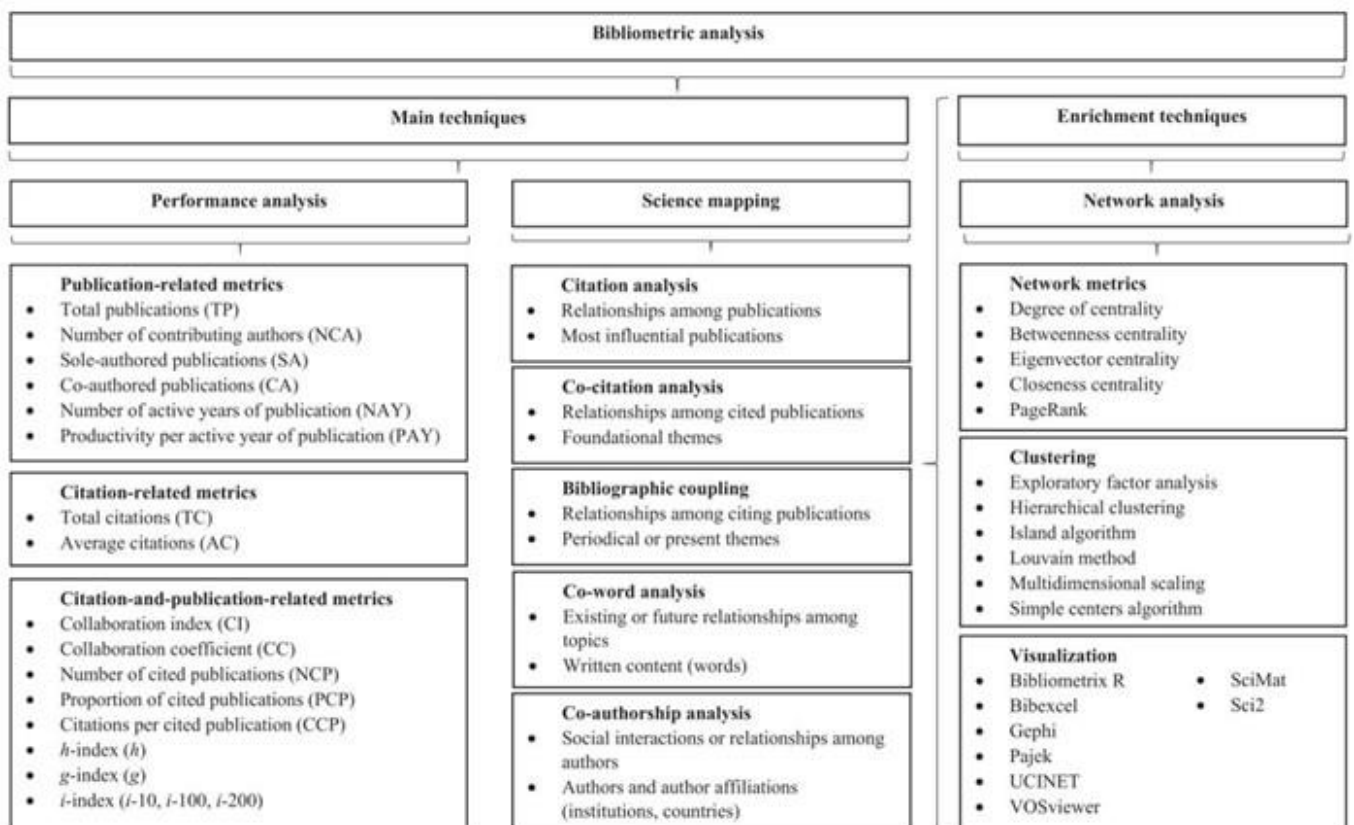


Figure 1: Bibliometric Analysis Tools



Based on Figure 1 for network analysis visualization, researchers use the help of the VOSviewer application. The visualization displayed includes 3, namely network visualization, overlay, and density. Performance analysis can be measured in various ways. One of the most important measures is the number of publications and citations per research constituent each year or per research constituent, publications are a measure of productivity, and citations are a measure of impact and influence. Other measures, such as citations per publication and h-index, combine citations and publications to measure the performance of research constituents. Although the analysis is descriptive, it recognizes various aspects of the research field that are important.

Science mapping looks at how research subjects interact with each other (18)(19). Intellectual interactions and structural relationships among research constituents are the subjects of analysis. Citation analysis, co-citation analysis, bibliographic coupling, shared word analysis, and co-authorship analysis are some of the science mapping techniques that are very useful for presenting the bibliometric structure and intellectual structure of a research field when used in conjunction with network analysis (19)(20). Naveen Donthu provides the bibliometric analysis procedure shown in figure 2 below.

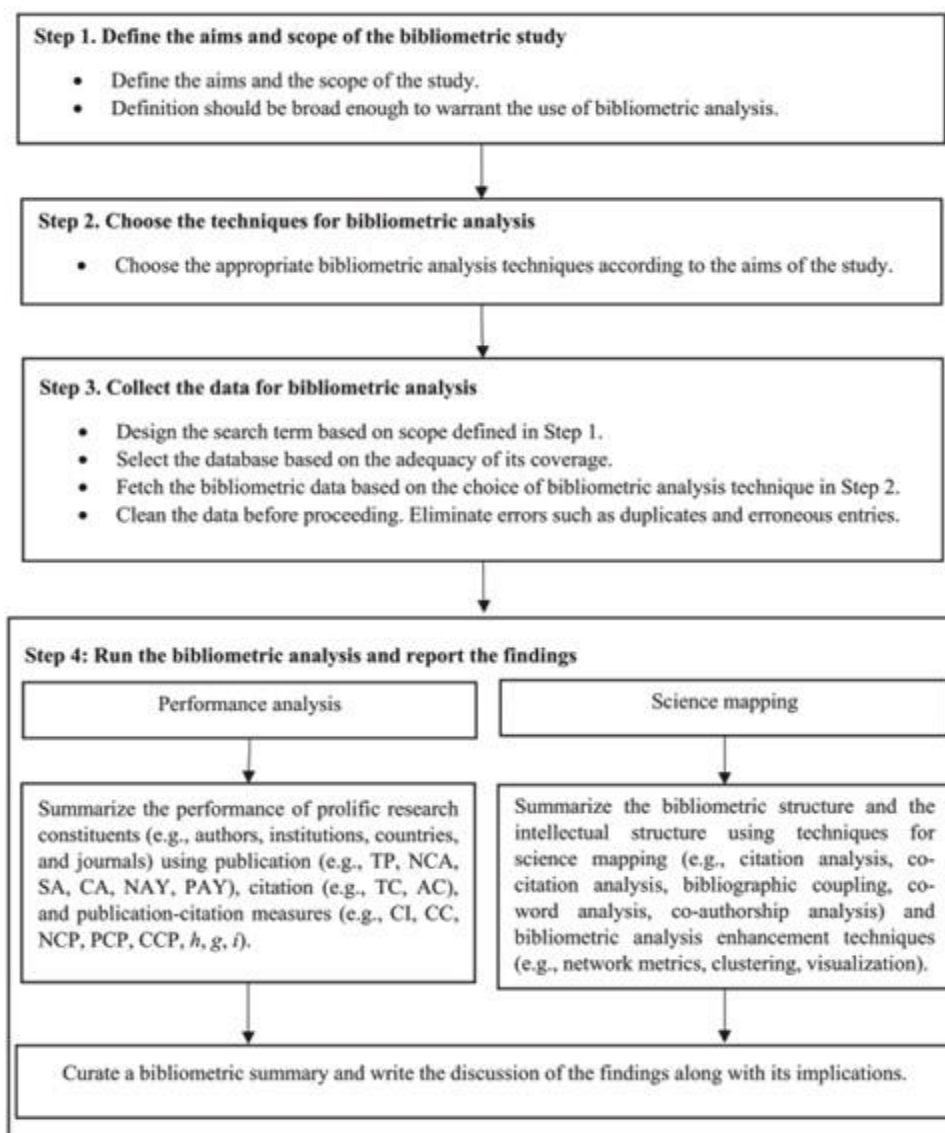


Figure 2. Bibliometric Analysis Procedure (17)

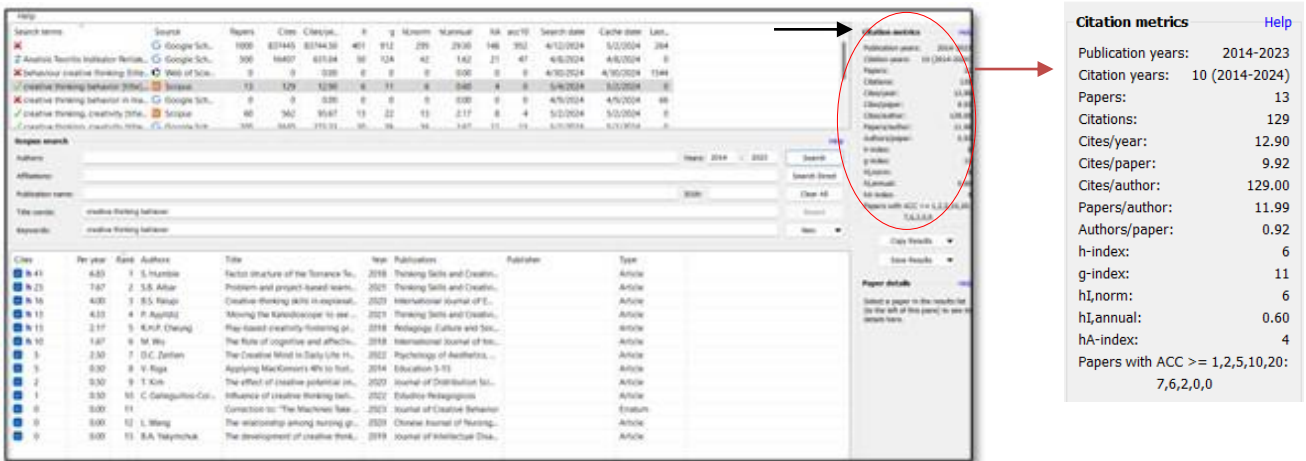
Step 1 by defining the purpose and scope of the research has been done above. Meanwhile, step 2 of selecting the techniques used for bibliometric analysis has also been determined above. Furthermore, step 3 to step 4 are described in the results and discussion below.

**RESULT AND DISCUSSION**

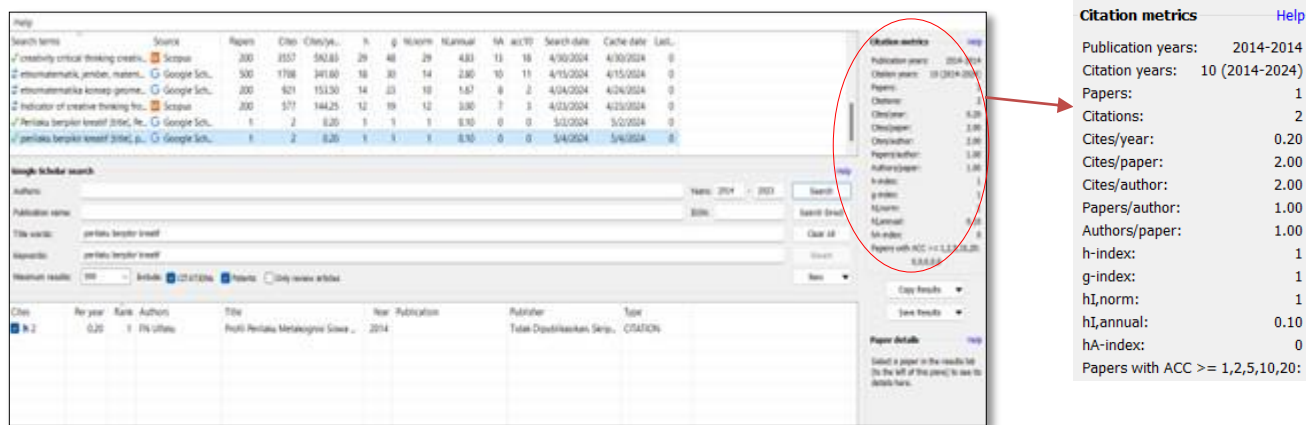
**Results Bibliometric Analysis Technique**

**a. Performance Analysis**

Search using the help of the Publish or Perish (PoP) application with a scopus and google scholar data base of 500 maximum in 2014-2023. The keywords "creative thinking behavior" in the search on scopus and "creative thinking behavior" search on google scholar with 500 maximum data are systematically displayed as follows.



(a) Scopus Database



(b) Google Scholar Database

**Figure 3. Publish or Perish (PoP) Search Sourced From Google Scholar**

Performance analysis based on figure 3 (a) sources from google scholar on citation metric shows 13 papers, 129 citations, 12.9 average citations per year, and 9.92 citations per paper. While 129 authors, 11.99 papaer/author, and 0.92 authors per paper. For H-index 6, G-index 11, and hI, norm 6. While hI, annual of 0.6 is the average annual increase in individual author's h-index and HA-index (sustainable citation rate) value 6. Figure 3(b) data source from google scholar on citation metric shows there is only 1 paper published in 2014, with 2 citations, 0.2 average citations per year, and 2 citations per paper. While 1 author, 1 author/author, and 1 author per paper. For H-index 16, G-index 1, and hI, norm 1. While hI, annual of 0.1 is the average annual increase in



individual author's h-index and HA-index (sustainable citation rate) value 0. All publications from google scholar and scopus are presented in figure 4 with the most publications worth 3 in 2018 and 2020. All data sourced from scopus and google scholar are summarized in RIS and CSV files. The data that has been stored is then subjected to content analysis with the help of the Mendelay application to view the content of each paper in the data base results file. This is done to observe the completeness of the title, author, keywords (21). Data from content analysis results sourced from scopus and google scholar totaling 11 papers are stored together in the RIS file.

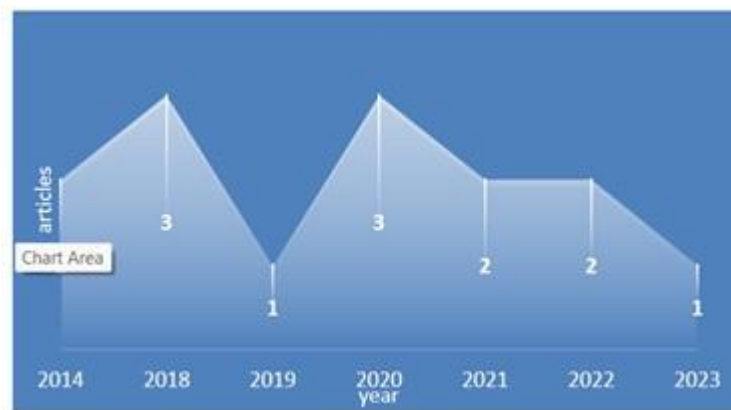


Figure 4. Publication Distribution of creative thinking behavior during 2014-2023

### Country Scientific Production Distribution

Figure 5 shows the distribution of a country's scientific production. The blue areas indicate countries that produce creative thinking behavior research, with the darker blue areas indicating the number of articles produced by the country. More detailed data on countries' scientific production from 2014 to 2023. Indonesia has the highest number of 2 out of a total of 11 articles while the other countries have only 1 article each.



Figure 5. Distribution of Countries in the World

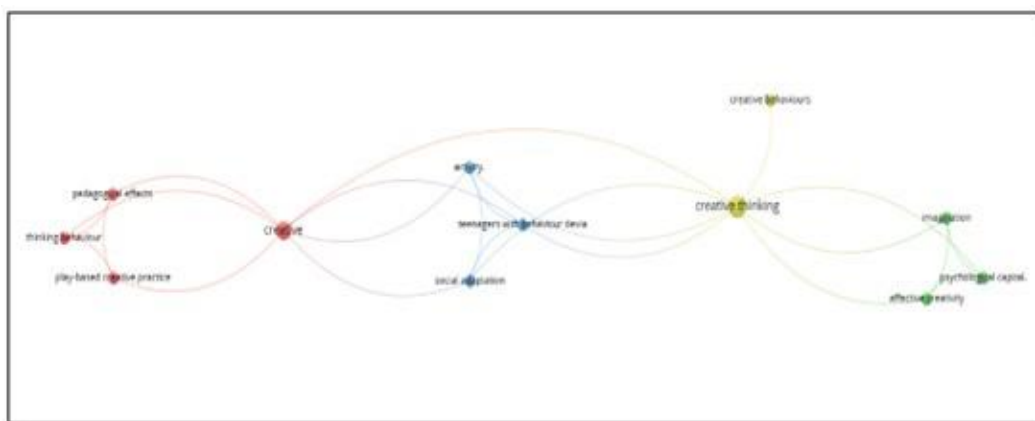
### Most Cited Sources

The bibliometric analysis of the data base shows that the document entitled "Factor Structure Of The Torrance Tests Of Creative Thinking Figural Form A In Kiswahili Speaking Children: Multidimensionality And Influences On Creative Behavior"

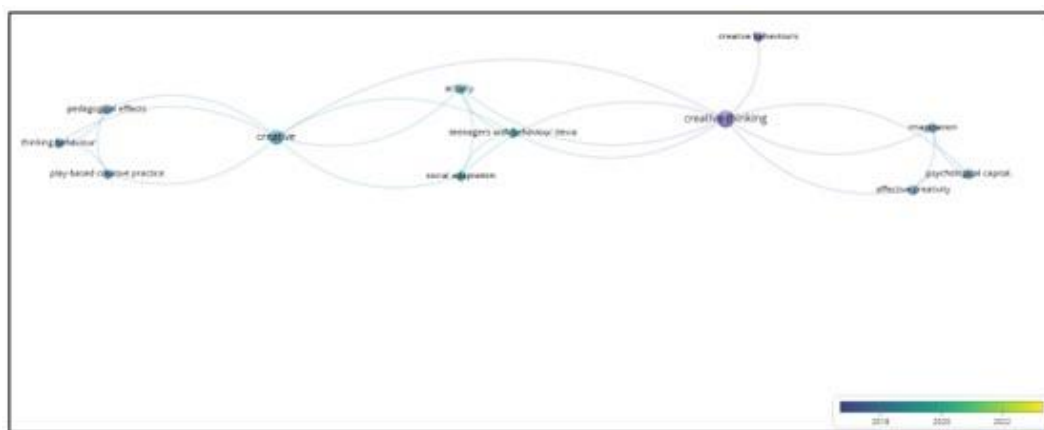
was cited the most. This article was published in the Journal: Thinking Skills and Creativity which was referenced 72 times in the period 2018-2023. The article discusses the creativity cycle as measured by Form A of the TTCT-Figural and finds that two factors-creative and adaptive-applicable to African and Western environments. Therefore, this study shows that creative making can be multi-dimensional and consists of two components. Using the two dimensions of creativity, innovative and adaptive, it can be surmised that a person's creative performance correlates with their environment and life background.

**Co-Occurrence Network**

The co-occurrence results based on keywords show that there are three clusters with 13 items obtained as shown in Figure 6 below. The largest clusters are creative and creative thinking with each of the largest clusters showing both connected to behavior, namely thinking behavior and creative behavior. While related to creative thinking behavior directly has not been found / obtained related to it. The closer the distance between items, the closer the relationship. Creative thinking has a fairly close relationship with creative behavior. However, there is no way to network that shows a relationship with creative thinking behavior.



**Figure 6. Co-Occurrence Network Visualization**



**Figure 7. Co-Occurrence Overly Visualization**

Figure 7 shows the co-occurrence of the number of items used in published research topics. The bottom left shows the year index according to the color given. The results in Figure 7 show that the color leads to the older this means that the item is old or according to the year. The younger the item, the more recent it is and there is still a lot of discussion about it. Yellow is the color that indicates the most recent time the item was used. However, in Figure 7 there is nothing that shows this color. This means that in the current period of time the item has not been developed to its full potential. Research with the theme of "behavior" has not been developed much, indicated by the absence of branches on "thinking behavior" and "creative behavior". As for "creative thinking behavior" there is still no one who discusses it in more detail. This is an opportunity that can be taken by researchers in taking the theme of research.

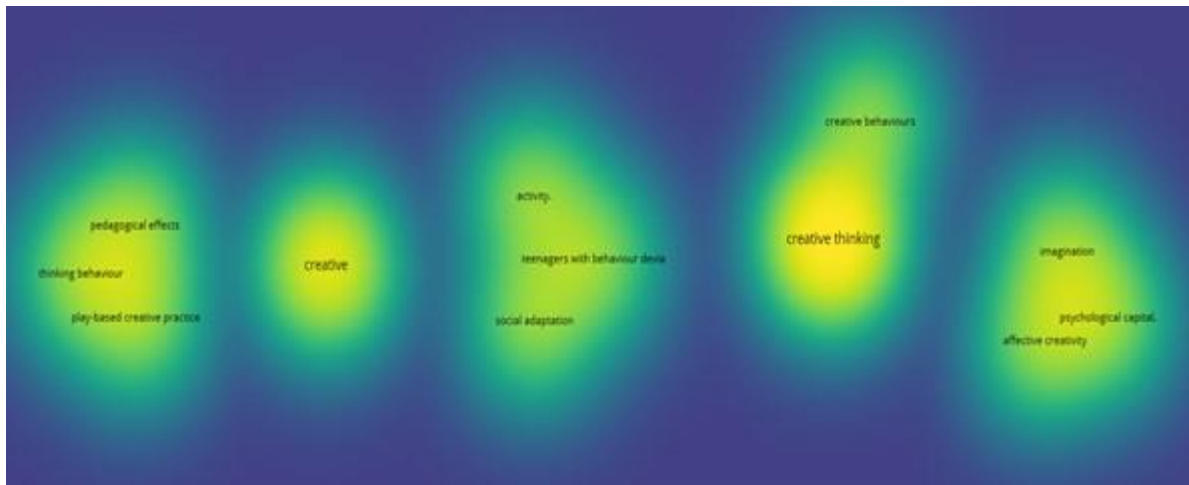


Figure 8. Co-Occurrence Density Visualization

Figure 8 above explains that the existence of items that experience density in the number of distributions to be raised in research topics. The more yellow and broad, the more the item has been taken up in the published research content. While those that are still yellow but still dark mean that there are still not many who raise it in research topics. this is what shows a great opportunity to be raised in research. In this case, it is shown by several items such as creative behavior, imagination, thinking behavior, and social adaptation.

**b. Scientific Mapping**

In scientific mapping includes several things that will be discussed including utilizing scientific mapping tools (citation analysis, co-citation analysis, bibliometric merging, shared word analysis, co-authorship analysis) and techniques for improving bibliometric analysis, summarizing bibliometric structure and intellectual structure. The discussion related to citation analysis explains to find out how often scientific works are cited, who cites them, and how they influence or contribute to the advancement of knowledge in the relevant field (21)(22). Globally, citation analysis, co-citation analysis, and bibliometric incorporation have been described according to Figure 3. As for the co-authorship network visualization, it can be shown as Figure 9 below.

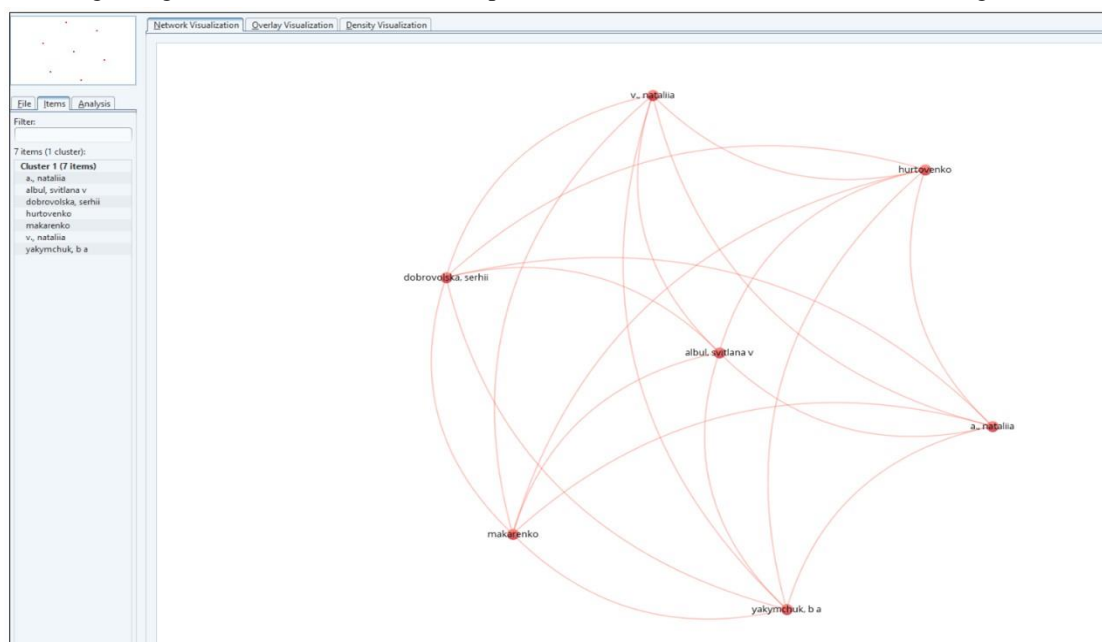


Figure 9. Co-Authorship Network Visualization



Co-authorship from the data base analysis results using the keyword creative thinking behavior shows that there are 7 items that describe the teamwork relationship between authors involved in scientific work. This indicates that two or more authors have contributed together to a scientific work. This view shows the structure of the collaboration network between the authors, including how large and complex the network is. The technique of improving bibliometric analysis by using the results of Publish of Perish CSV data is then analyzed and remapped (23). The completeness test was carried out with the help of the Mendelay application, so that further processing with VOSviewer data could be used to obtain the specified analysis results. The data base of the analysis results has successfully confirmed that 27% were published in the journal "Thinking Skills and Creativity". The rest were published in journals such as "Psychology of Aesthetics, Creativity, and the Arts", "Pedagogy, Culture and Society", "Journal of Intellectual Disability - Diagnosis and Treatment", "Journal of Distribution Science", "International Journal of Innovation, Creativity and Change", "International Journal of Emerging Technologies in Learning", "Estudios Pedagogicos", and "Education 3-13". Globally, publications are not dominated by just one journal but the diversity of journals involved in the publication of these articles. This shows that related to creative thinking behavior, the interest in discussing it is still very lacking and unevenly distributed.

## CONSLUTION

The results of the descriptive content analysis and bibliometric analysis show the general systematics of the existing literature and help identify possible gaps in research related to creative thinking behavior. In addition, this study informs readers about documents and sources that should be examined as a basis for creative thinking behavior research can be developed. The findings also show that there is no country that specifically discusses creative thinking behavior. The discussion raised is only about thinking behavior and creative behavior. In this study, not many published articles can be used as a reference to research on creative thinking behavior. Research themes on creative thinking behavior can also be identified through research trends. This study has produced a framework for research on creative thinking behavior through creative thinking, creative behavior, and thinking behavior. There is a small database of analysis results used in this research. Since this research only uses Scopus and google scholar databases, the research methodology of creative thinking behavior is also limited. The results of this study can be developed through additional research using other alternative databases and keyword searches. The findings of this study may be useful as a research guide for future researchers who want to research creative thinking behavior. The results showed that the existing literature was systematic and helped to find gaps in research related to creative thinking behavior. The findings showed that the countries talked about creative thinking behavior. Thinking and creative behavior were the only topics of discussion. The study does not have many publications that can be used as references for research on creative thinking behavior. Research trends can also help identify research subjects on creative thinking behavior. Creative, creative, and thinking behaviors have been studied in this study.

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