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Research Trends on Creativity in Science Learning: A Literature Study (2018-2023)

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Abstract: Creativity is one of the skills that students must have as a requirement to face the challenges of 21st century learning. This research aims to identify and analyze research trends on creativity in science learning in the form of journal ranking classifications, author and country of origin classifications as well as classifications based on keywords. This research is a type of qualitative research. The data used in this research was obtained from documents indexed by Google Scholar from 2018-2023 using Publish or Perish and Dimension.ai. The data analysis method used is bibliometric analysis with the help of VOSviewer software. The results of the analysis obtained show that the trend of writing articles about creativity in science learning has increased significantly in 2020, decreased in 2021 and increased again in 2022. The types of publications carried out include articles contained in journals, chapters, books, monographs, proceedings and preprints. The journal that contains the most articles about the PjBL model in science learning is the Journal of Physics Conference Series with total publications of 560 articles and 2,193 citations.

Keywords: creativity, science learning.

▪ INTRODUCTION

The development of globalization affects all aspects of life, including the field of education. To be able to keep up with current developments, the world of education is required to be able to develop the skills demands of the 21st century. This aims to ensure that students have the provisions to live in an era with various advances in technology and information (Widodo & Wardani, 2020). The skills needed to face the challenges of the 21st century are 4C skills which include critical thinking skills, collaboration, communication and creativity (Trisnawati & Sari, 2019; Hermansyah, 2020).

Creativity in the 21st century has an important role in improving the quality of education in all areas of learning, science and technology, including science learning (Wulandari, 2019). Science is a subject that is closely related to nature. Science learning needs to be done contextually to instill a positive attitude in students. Apart from that, it is necessary to develop learning creativity that can help students understand concepts in science subjects (Siregar, 2020).

The science learning process involves students actively in learning, namely through activities of proposing hypotheses, collecting data, using evidence, designing an investigation through experimental activities that prioritize students' own curiosity and creativity. Through a series of processes in learning activities, students gain a number of skills or creativity that can build their scientific attitude (Kanna et al., 2018).

Manobe & Wardani (2018) state that creativity is a person's ability to produce something new, whether in the form of a completely new idea or real work or a combination of pre-existing components. Creativity is a person's ability to express ideas

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they have through a creative thinking process to create something new with full attention, focus and perseverance (Herak & Lamanepa, 2019). Characteristics of creativity include: 1) having a high curiosity; 2) generate diverse ideas to solve problems; 3) often submit opinions or responses that are unique and different from those of other people; 4) dare to take risks; 5) likes to try new things (Merpati et al., 2018).

Based on the description above, researchers are interested in analyzing trends in creativity research in science learning. This research is important for several reasons, namely 1) the results of this analysis can be used as consideration for teachers or researchers in the science field to conduct research related to creativity in science learning 2) the results of this analysis can be used as a reference source for teachers and researchers in the science field who conduct research about creativity in science learning. There has been a lot of research related to creativity in science learning. The following is a graph of creativity research trends that have been carried out from 2018-2023.

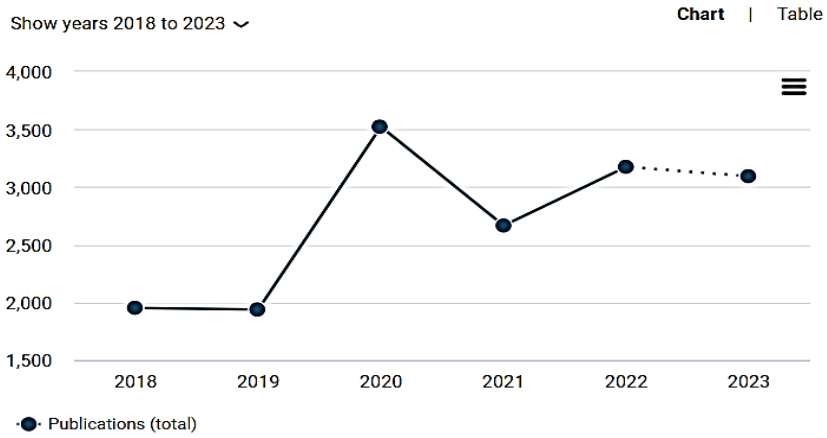

Figure 1. Creativity research trends 2018-2023 (Source: app.dimension.ai)

Figure 1 shows that research related to the application of creativity in science learning is still being carried out from 2018 until now. This research experienced a significant increase in 2020, decreased in 2021 and increased again in 2022.

▪ METHOD

This research is a type of qualitative research. Qualitative research is research that is descriptive and tends to use analysis where the researcher is the key instrument (Farghaly, 2018). The data used in this research was obtained from documents indexed by Google Scholar using Publish or Perish and Dimension.ai. The keywords used in searches on Google Scholar are Creativity and Science Learning. The documents analyzed were 995 documents indexed by Google Scholar between 2018 and 2023. The Google Scholar database was chosen as a place to search for data or documents because Google Scholar applies consistent standards to select documents to be included in its index. Additionally, Google Scholar displays more documents than top databases, especially for research in education (Hallinger & Chatpinyakop, 2019; Hallinger & Nguyen, 2020).

▪ RESULT AND DISCUSSION

The research was conducted with the aim of analyzing research trends related to creativity in science learning. Creativity is one component of the 4C skills which is a

demand for learning in the 21st century (Mardhiyah et al., 2021; Soleh & Arifin, 2021; Fitrah et al., 2022). Creativity in the 21st century has an important role in improving the quality of education in all areas of learning, including science learning (Wulandari et al., 2019; Hermansyah, 2020; Nurmala et al., 2021). From this description, it can be seen that a lot of research has been carried out on creativity by researchers, especially in the field of science learning. Below are presented trends in creativity research based on the type of publication.

Table 1. Research trends on creativity in science learning based on publication type

Publication Type	Publications
Article	13.936
Chapter	9.278
Edited Book	3.098
Monograph	2.093
Proceeding	1.378
Preprint	227

Table 1 shows that research on creativity in science learning in the period 2018 to 2023 is contained in six types of publications, namely 13,936 articles, 9,278 chapters, 3,098 books, 2,093 monographs, 1,378 proceedings and 227 preprints. From these data, it can be seen that the most types of publications about creativity in science learning are published in the form of articles. This is in line with research conducted by (Doncheva et al., 2018; Emrouznejad & Yang, 2018; Triansyah & Muhammad, 2023) showing that the type of publication most widely used for publication of scientific work is articles contained in journals. Below are the top 10 journal sources that publish a lot about creativity in science learning from 2018 to 2023.

Table 2. Top 10 researchers creativity research trends in science learning 2018-2023

Authors	Organizations	Citations Mean
Chin-Chung Tsai	National Taiwan Normal University	46.07
Insih Wilujeng	Yogyakarya State University	4.15
Polona Sprajc	University of Maribor	0.02
Iztok Podbregar	University of Maribor	0.02
Damjan Maletic	University of Maribor	0.02
Mirjana T Radovanovic	Educons University	0.02
Roger J R Levesque	Indiana University Bloomington	0.09
Dwi Agus Kurniawan	Jambi University	9.55
Gwo-Jen Hwang	National Taiwan University of Science and Technology	52.02
Valarie L Akerson	Indiana University Bloomington	54.76

Table 3. Top 10 sources journal of creativity research trends in science learning 2018-2023

Journals'Name	Publications	Citations	Citations Mean
Journal of Physics Coference Series	560	2.193	3.92

Advance in Social Science, Education and Humanities Research	446	302	0.68
Jurnal Penelitian Pendidikan IPA	390	270	0.69
Lecture Notes in Computer Science	375	1.988	5.30
International Journal of Science Education	332	11.979	36.08
Eurasian Journal of Educational Research	251	2.013	8.02
Journal of Research in Science Teaching	244	18.076	74.08
AIP Conference Proceedings	225	250	1.11
Science Education	193	3.263	16.91
Science & Education	183	8.271	45.20

Table 2 shows that the researcher who published the most articles related to creativity in science learning is Chin-Chung Tsai. Chin-Chung Tsai is a researcher from the National Taiwan Normal University, Taiwan, who has published in 59 journals with an average annual citation of 46.07 followed by a researcher named Insih Wilujeng from Yogyakarta State University, Indonesia with an average number of publications in 54 journals. Annual quotation 4.15 onwards as shown in the table. Apart from the top 10 researchers who have published research results on creativity in science learning, in Table 3 data is shown for the top 10 journals which publish on creativity in science learning with the Journal of Physics Conference in first place. Furthermore, in Figure 2, the VOSviewer visualization results of other researchers regarding similar matters are displayed.

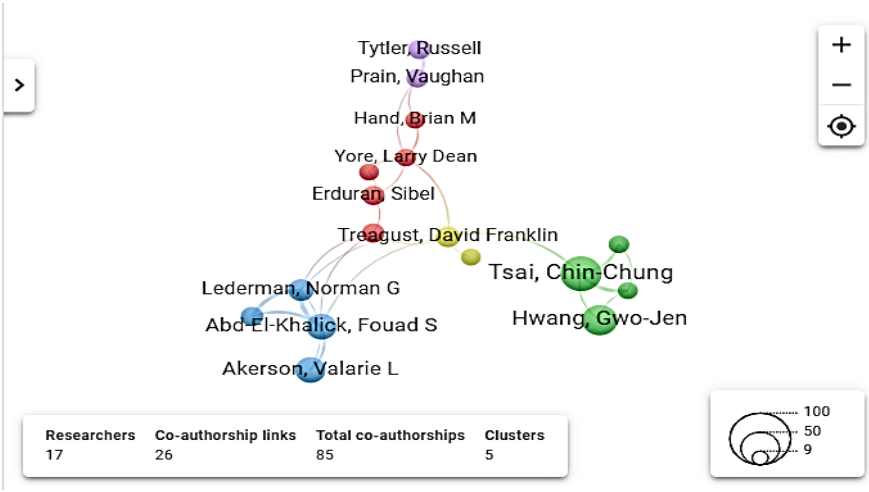

Figure 2. Creativity researcher 2018-2023

Figure 2 shows the relationship between one researcher and another researcher who writes and publishes articles about creativity in science learning. In this data there are 17 researchers with 26 co-authorship links.

The following discussion will present graphic visuals of mapping results from articles about creativity in science learning. The results of this analysis become an interpretation of article publications based on research objects that are often studied and analyzed. Related to bibliometric analysis, mapping science is a method used to visualize study objects from a field of science (Chandra, 2018; Chen & Song, 2019). This visualization is carried out by creating a landscape map which can provide visual information about the study topic in this literature study, namely creativity in science

learning. The results of bibliometric mapping from the shared word map network for article publications on the topic of creativity in science learning can be seen in Figure 3 below.

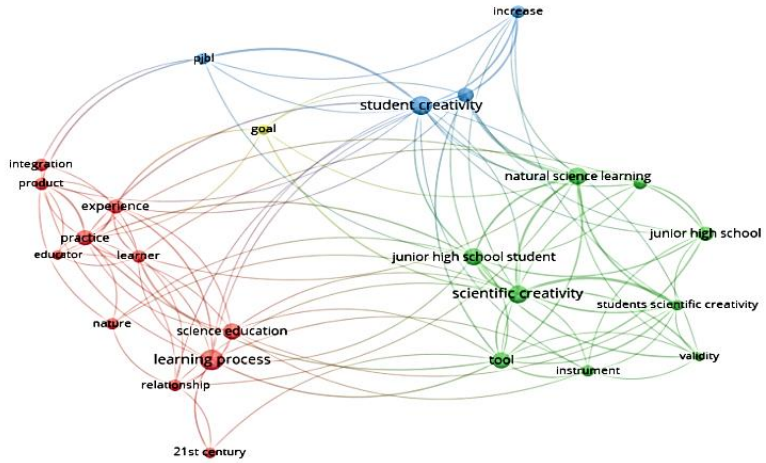

Figure 3. Circles network visualization

Figure 3 shows the results of mapping bibliometric keywords on research trends on creativity in science learning. In this image there are 23 keyword items that are often used in research related to creativity in science learning from 2018 to 2023. The image contains four clusters, where the first cluster in blue contains 3 keyword items, including: student creativity, pjbl and increase . The second cluster in yellow contains 1 keyword item, namely goal. The third cluster in red contains 11 keyword items including: learning process, science education, 21st century, relationship, nature, learner, educator, practice, experience, product and integration. The last cluster in green contains 8 keyword items, namely scientific creativity, students scientific creativity, natural science learning, junior high school, junior high school students, tools, instruments and validity. The results of visualization analysis with network clusters show that there are four clusters in the mapping of articles related to creativity in science learning.

Keywords classified into four clusters are arranged in a color chart which shows the clusters that are connected to each other. The results of this analysis can be used to determine research trends based on keywords in the last year. The more keywords that appear, the wider the visualization displayed. Below in Figure 4, the keywords for creativity in science learning are also presented by year.

Figure 4 shows the trend of article writing themes in Google Scholar indexed journals by year. The trend in the theme of writing articles related to creativity in science learning from the previous year to the latest is marked by the color themes purple, dark blue, turquoise green, light green and yellow. These results show that the keywords student creativity, increase, integration, educator and relationship are the latest themes related to research on creativity in science learning. This can certainly be the latest reference for further research. Research related to creativity in science learning can also be visualized as in Figure 5 below.

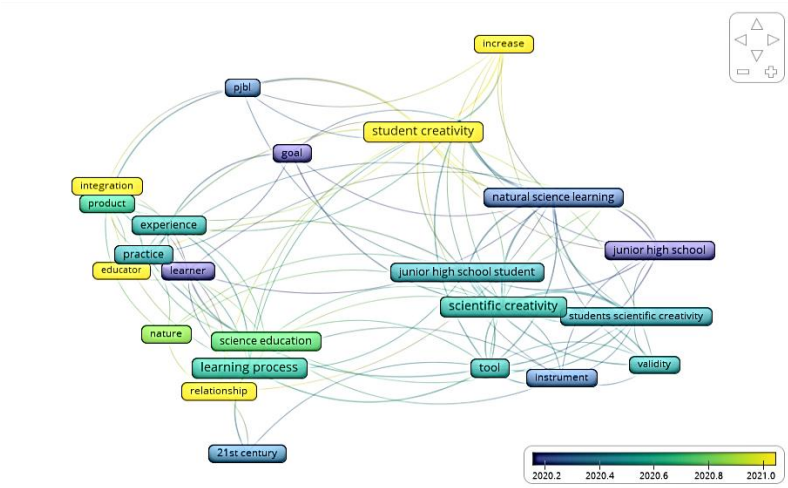

Figure 4. Frames overlay visualization

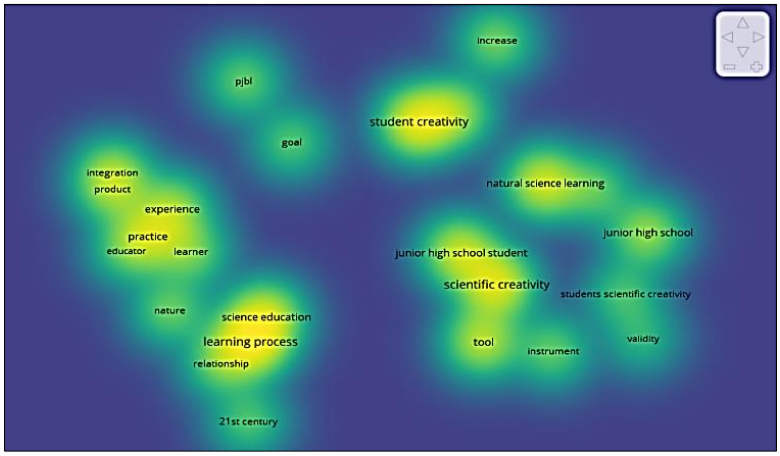

Figure 5. Density visualization

Figure 5 shows the results of research theme density analysis. The density of the research theme is marked in bright yellow. The brighter the color visualization of a theme, the more research will be carried out. On the other hand, the darker the color, the less frequently the research is carried out. The bright yellow color in the image shows keywords that are frequent and trending in a study (Liao et al., 2018; Kaur et al., 2022).

▪ CONCLUSION

The trend of writing articles in the SINTA indexed journal about creativity in science learning for the 2018-2023 period has increased and decreased. In 2020 there was a significant increase, decreased in 2021 and increased again in 2022. Types of publications regarding the PjBL model in science learning are articles, chapters, books, monographs, proceedings and preprints. Articles published in journals are one of the most common forms of publication. The name of the researcher with the most publications on creativity in science learning is Chin-Chung Tsai. Meanwhile, the journal with the most publications using the keywords creativity and science planning is the Journal of Physics Conference with 560 publications with 2,193 citations.

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