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ABSTRACT: The aim of this study is to examine the trends in recent years through the bibliometric results of articles on scientific creativity. For this purpose, a total of 370 publications on scientific creativity obtained from Web of Science and Scopus databases were examined. The publications were examined in terms of different bibliometric variables and presented with visuals and tables. Bibliometric analysis of the publications in both databases was performed separately. Afterwards, the top 10 prominent in scientific creativity studies in both databases were compared and integrated with each other. Tables and images were created with the VOSviewer package program. According to the results obtained, the most frequently used words in the research in both databases were determined as "scientific creativity" and "creativity". Similarly, the countries with the highest number of studies and citations in both databases were determined as USA and China. The top three most cited authors in scientific creativity studies in both databases are Simonton, D.K., Hu, W., and Sternberg, R.J. conclusion has been reached.

Keywords: bibliometric analysis, scientific creativity, scopus database, wos database

ÖZ: Bu çalışmanın amacı, bilimsel yaratıcılığa ilişkin makalelerin bibliyometrik sonuçları üzerinden son yıllardaki eğilimleri incelemektir. Bu amaçla Web of Science ve Scopus veri tabanlarından elde edilen bilimsel yaratıcılığa ilişkin toplam 370 yayın incelenmiştir. Yayınlar bibliyometrik farklı değişkenler açısından incelenmiş, görseller ve tablolar şeklinde sunulmuştur. Her iki veri tabanında yer alan yayınların ayrı ayrı bibliyometrik analizi yapılmıştır. Sonrasında her iki veri tabanında bilimsel yaratıcılığa ilişkin çalışmalarda öne çıkan ilk 10'lar birbiriyle karşılaştırılmış ve birbirine entegre edilerek sunulmuştur. Tablolar ve görseller VOSviewer paket programı ile oluşturulmuştur. Elde edilen sonuçlara göre her iki veri tabanında da araştırmada en sık kullanılan anahtar kelimeler "scientific creativity" ve "creativity" olarak belirlenmiştir. Benzer şekilde her iki veri tabanında çalışma sayılarının ve aldığı atıf sayılarının en fazla olan ülkeler USA ve Çin olarak belirlenmiştir. Her iki veri tabanında da bilimsel yaratıcılık çalışmalarında en çok atıf alan ilk üç yazarın Simonton, D.K., Hu, W., ve Sternberg, R.J. olduğu sonucuna ulaşılmıştır.

Anahtar kelimeler: bibliyometrik analiz, bilimsel yaratıcılık, scopus veritabanı, wos veritabanı

Creativity is a process that can be developed with the appropriate education and is the ability of every individual to create a new product by using their imagination (Kilic and Tezel, 2012; Rawat et al., 2012). It will be difficult for societies of individuals who cannot use their creativity and not reveal their original ideas to move forward in the age of being present (Denis Celiker and Balim, 2012). Creativity is an individual feature that allows people to adapt to the environment they live in and improve themselves (Yurdakal, 2019). Creativity has been considered a concept used in art for many years (Denis Celiker and Balim, 2012) but it has been introduced in different definitions to the concept of creativity used in science (Koray, 2004). Although scientific creativity is an important concept both individually and socially, there is no single definition (Demirhan et al., 2018). Scientific creativity was define by Aktamis and Ergin (2007) as "it depends on what steps are used when developing a new product or developing an existing product, how the problem is solved and how the problem is recognized". In addition, scientific creativity is defined, based on previous experience and knowledge, as sensitivity to problems and problem solutions, understanding and fascinating the nature of science, developing new, extraordinary and useful scientific information, experiments, theories and products (Usta and Akkanat, 2015).

In the 21st century, scientific creativity is both the condition of life and the skill expected to be found in individuals (Rizqi and Kirana, 2020). In order for societies to constantly develop and adapt to changes, individuals need to have scientific creativity (Sternberg, 2010). Scientific creativity allows individuals to integrate information that exists in everyday life, to create solutions to problems encountered, and to bridging daily life and their knowledge (Lin et al., 2003). Individuals who are allowed to use their scientific creativity will be able to recognize what others may be missing, as well as the role of an observer during research (Meador, 2003).

Structuring and solving problems encountered is a process of creativity. Therefore, individuals who can use scientific process skills in the problem solving process are considered to have more scientific creativity (Bakac, 2018; Hu and Adey, 2002; Mumford et al., 1994).

Scientific process skills, problem solving skills and scientific creativity in the science science course have a related (Aktamis and Ergin, 2007; Cheng, 2004) shows that science science education and scientific creativity have a common point göstermektedir (Liang, 2002). For this reason, the scientific creativity of individuals is expected to increase as their academic achievements in education levels and science studies are increased (Demirhan et al., 2018). When the studies were examined, it was observed that as students' achievements in science science class increased, their scientific creativity increased, and there was a meaningful relationship between scientific process skills and scientific creativity (Baysal et al., 2013; Ceran et al., 2014; Sahin-Pekmez et al., 2010; Yang et al., 2016). The use of the skills gained in science science science in the process of scientific creativity shows that science education is important in developing scientific creativity. Accordingly, it is thought that the importance of countries to science education will also lead to the development of individuals who can use scientific creativity, and these individuals will play important roles in the development of societies (Hacioglu and Kutru, 2021; İkikat, 2019).

Literature Review and Conceptual Framework

Creativity

It is known that the first use of creativity extends to Pluto (Maba, 2019). In his speech to the American Psychology Association in 1950, Guilford described creativity as an option to focus on individual characteristics, motivations and behaviors, has changed the way creativity has been conceptualized ever since (Kurtzberg and Amabile, 2001). Creativity has become a complex concept that affects their lives even when individuals are not aware of it, and houses them within certain processes and applications (Barnett, 2019; Robinson, 2008). Creativity has conceptualized the form of person-centered approaches and context-centered approaches, the person-centered approaches are more emphasizing the inner aspects of creative performance, context-centered approaches focus on the interaction of the individual with the external context in which it lives (Sternberg and Lubart, 1992). The concept of creativity has been defined differently as a behavior that each individual can have and can be used in any domain (Koray, 2004).

Torrance (1968) defined creativity as a new product that is introduced to the solution of the problem in the face of the problem faced by the individual. Creativity is a skill that exists in every individual and can be found in every part of human life, a whole of processes, an attitude and behavior that engulfies a vast area from everyday life to scientific studies (San, 1979). Dowd (1989), which defines creativity as the process of putting a new product in the middle, did not characterize a non-outcome process as creativity. Creativity is also defined as seeing and combining details (Cellek, 2003). Although there are many definitions of creativity, creativity, in general, can be defined as a form of behavior, contrary to conventional and stereotyped ideas, an ability to produce a new product that is effective in all problem-solving processes, taking a broad view of problems without limiting them (Karakus, 2001; Koray, 2004).

Creativity has been defined as the key to achieving a better standard of living, making creativity an important element in education (Robinson, 2008). The fact that creativity is a skill that can be developed through education has also enabled it to be integrated into education systems over the world (Kilic, 2017). Wyse and Ferrari (2015), found in their study that they included the importance of creativity in all 27 European Union countries' national curricula and that politicians and curriculum developers accepted the importance of creativity for education. The development of creativity and creative thinking skills is included in the primary education programs prepared in Turkey as a purpose, strategy, and method (MEB, 2018). In addition, creativity has been integrated in China as a skill that has to be gained to education programs since 2001 (Vong, 2008).

Scientific Creativity

Creativity is specific to the domain and includes a scientific background (Mukhopadhyay and Sen, 2013; Sak and Ayas, 2013). Science consists of creative efforts and creativity play an important role in the process of producing scientific information (Hadzigeorgiou et al., 2012; Hu and Adey, 2002; Kanli, 2014). If scientific creativity and ideas do not have a specific background and do not create original content, they cannot be considered as creative ideas (Huang and Wang, 2019; İnel-Ekici, 2020). Progress in science and technology is regarded as a significant reflection of creativity (Heller, 2007). Scientific creativity in the 21 st century is a skill that individuals must have to face the problems of the globalized world and to produce solutions to these problems (Vries and Lubart, 2017). Therefore, today's education systems have made scientific creativity an important factor in the teaching and learning process (Rasul et al., 2018). Individuals tend to solve problems that occur in their environment as long as they become interested, so finding and solving scientific problems is unique to scientific creativity (Ayverdi, 2012).

Scientific creativity is a considerable concept for both individuals and societies, but there is no single definition such as creativity (Demirhan et al., 2018). Scientific creativity has described as "developing theories always requires adding to previous known ones to produce a new product or process" (Denis Celiker et al., 2015). Another definition of scientific creativity is the "ability to learn scientific knowledge and solve scientific problems" (Wang and Yu, 2011). The development of scientific creativity is thought to be based on Hu and Adey's studies (Kilic and Tezel, 2012). Hu and Adey (2002), defined scientific creativity as "kind of intellectual trait or ability producing or potentially producing a certain product that is original and has social or personal value, designed with a certain purpose in mind, using given information" in their study. They stated that scientific creativity is based on scientific knowledge and skills, and is composed of static structure and developmental structure. They also put forth "The Scientific Structure Creativity Model (SSCM)" (Hu and Adey, 2002). (See Figure 1).

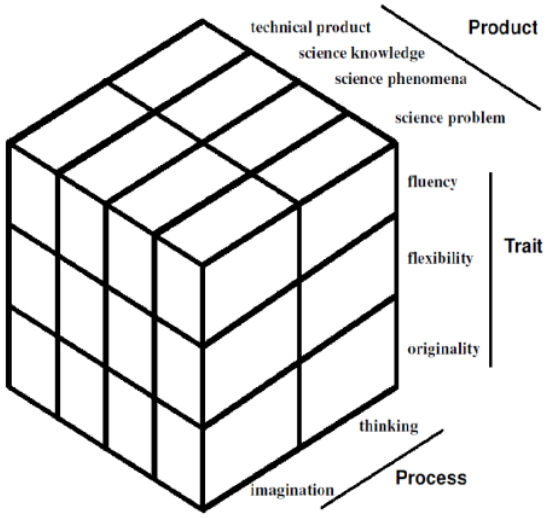


Figure 1. The Scientific Structure Creativity Model (SSCM) (Hu and Adey, 2002)

According to this model, scientific creativity consists of a three-dimensional and dynamic structure. Scientific creativity in the model consists of three dimensions; process, trait, and product. The process dimension consists of the subdimensions of thinking and dreaming. HU and Adey (2002) emphasized that scientific creativity is a process, and that it includes the ability to imagination and thinking in the process. The trait dimension creates subdimensions of originality, flexibility and fluency. At the end of this process, they emphasized the importance of being fluent, flexible, and original thinking to produce products. The product dimension consists of sub-dimensions of technical product, science knowledge, science phenomena and scientific problem. The products at the end of the scientific creative process should be designed to solve a scientific problem, designed to be a technical product and associated with scientific knowledge and a scientific phenomenon (Hu and Adey, 2002).

The study on scientific creativity in recent years has shown that the content of the studies are; researches of the impact and relationships of different learning and teaching approaches and activities on scientific creativity (Akcanca and Cerrah Ozsevgec, 2017; Astutik et al., 2020; Karademir, 2016; Kozhevnikov et al., 2021; Panjaitan and Siagian, 2020; Siew and Ambo, 2020; Wicaksono, 2020; Wulansari et al., 2019; Zainuddin et al., 2020; Zhao et al., 2021; Zhou, 2021), the effects of STEM and STEAM applications on scientific creativity were examined (Calisici and Benzer, 2021; Genek and Doganca Kucuk, 2020; Rasul et al., 2018; Siew and Ambo, 2020), the effects of different thinking models on scientific creativity and the relationships between them were analyzed (Demir, 2015; Forthmann et al., 2020; Vries and Lubart, 2017; Wulansari et al., 2019; Zhu et al., 2019), the studies of perception, attitude, and beliefs related to scientific creativity and the impact of scientific creativity on academic achievement (Calisici and Benzer, 2021; Demirhan ve Sahin, 2021; Lee and Park, 2021; Ndeke et al., 2016), evaluation of the relationship between problem-solving skills, questioning skills, and scientific process skills, and scientific creativity (Chen et al., 2016; Demirhan and Sahin, 2021; Panjaitan and Siagian, 2020; Utemov et al., 2020; Yang et al., 2016; Zainuddin et al., 2020), researches of the impact of science games and toys, animations, and WEB tutorials on

scientific creativity (Atesgoz and Sak, 2021; Demir Kacan, 2015; Lupu et al., 2019), the studies developed by tools to measure scientific creativity and the adaptation of these tools (Aktamis et al., 2005; Bhat and Siddiqui, 2017; Denis Celiker and Balim, 2012; Hu and Adey, 2002; Siew and Lee, 2017).

As studies on scientific creativity are recent, detailed information about these studies is newly (Saptono and Hidayah, 2020). When the examined the literature on scientific creativity there was seen conducted studies about analysis of the scientific creativity studies (Boxenbaum, 1991; Stumpf, 1995; Saptono and Hidayah, 2020) but cannot found bibliometric analysis in the Google Scholar, ERIC, Scopus, and Web of Science databases.

The accumulated literature records can be summarized in bibliometric methods as a result of increased studies on a particular topic (Ozkaya, 2019). In bibliometric studies, data resources are international scientific reference indexes. Since these indexes can be accessed via the Web of Science (WoS) or Scopus databases, WoS and Scopus are considered as a database that contributes significantly to bibliometric studies (Guz and Rushchitsky, 2009; Guzeller and Celiker, 2017). WoS is a reference database that contains more than 10.000 magazines and different information collected from journals, conferences, reports, books and book series (Aghaei Chadegani, et al., 2013). Scopus is a database that contains more than 16.000 journals and more than 4000 publishers and offers quote-based measurements (Guz and Rushchitsky, 2009). Therefore, the article, book, thesis, statement, report, etc. in the WoS and Scopus databases bibliometric analysis of document types can be performed using this resources (Sonmez, 2020).

In the current study, the resources in the international reference indexes were used to analyze the studies on scientific creativity. Reveals the scope of the studies of scientific creativity and finding out which studies lead to scientific creativity is the necessity of current research and its main purpose. Based on this purpose, the following research problems have been sought:

In Web of Science and Scopus databases;

1. What are the WoS categories and Scopus categories of the publications scanned using the keyword "scientific creativity"?
2. What are the 10 most cited publications in the scientific creativity studies?
3. Within the scope of published studies on scientific creativity;
    a. Who are the 10 most cited contributors?
    b. Who are the authors with the 10 most studies?
4. Which are the 10 most active journals within the scope of published studies on scientific creativity?
5. Which countries have the 10 most publications within the scope of scientific creativity?
6. What are the 10 most active institutions within the scope of published studies on scientific creativity?
7. What are the 10 most common keywords in scientific creativity studies?

Method

Design

Bibliometric analysis is preferred as a data analysis technique in the current research. Bibliometrics is a method that enables analysis to statistically visualized of trends specific to the area being investigated learning about the activities of scientific publications, specific features of publications (number of studies published every year, multi-studies topics,co-references, journals where studies are published, keywords, countries and institutional co-operation, etc.) (Al, 2008; Al and Costur, 2007; Ciftci et al., 2016; Ozkaya, 2019). Bibliometric analysis is a method used to provide quantitative analysis of written publications (Ellegaard and Wallin, 2015) and to improve access to information and to learn more about the structure of the information (Carter - Templeton et al., 2018).

Social network analysis is used to determine co-citation relationships in bibliometric analyses (Guzeller and Celiker, 2017). Social network analysis can visualize co-citation networks and identify key actors in the field of research (Karagöz and Yüncü, 2013). In a social network analysis image, the size of the nodes reflects the frequency of the common quote (Van Eck and Waltman, 2014). It has a more frequent quotation rate of nodes that are too close to each other in the nodes in the images. It can be interpreted that the links connecting the two nodes are also quoted by other researchers. The closely connected color node sets represent important research themes in the field of research (Hallinger, 2020).

Collection of Data

The scientific documents analyzed were first acquired from the WoS database by scanning it with the keyword "scientific creativity". The concept of scientific creativity is limited to be in the "title" section of the documents. No restrictions were made during publication years. Bibliometric records of 192 studies from 1975 to 2021 were recorded in the format to be analyzed in the VOSviewer (Version 1.6.17) (Van Eck and Waltman, 2010) package program. Secondly, the Scopus database was scanned with the keyword "scientific creativity". In the Scopus database, the concept of scientific creativity is limited to be in the "title" section of the documents. Bibliometric records of 178 documents were recorded in the format that can be processed in the VOSviewer package program from 1975 to 2021 in the Scopus database. The process of reaching the documents analyzed in the current study was terminated on December 27, 2021.

Findings

In this section, the findings from the analysis results from the WoS and Scopus databases were presented in visual and table, by comparing and integrating them in the framework of research problems.

Categories of Publication in Scientific creativity Studies

As part of the first subproblem of the current study, the study on scientific creativity in the WoS and Scopus databases has been determined in which categories. The top 10 categories published from the findings obtained are given in Table 1.

Table 1.

Top 10 WoS Categories and Scopus Categoris of Publications Scanned with the Keyword "Scientific Creativity"

WoS Database Categories	**N**	**Scopus Database Categories**	**N**
Education/Educational Research	43	Social Sciences	81
Psychology Multidisciplinary	28	Art and Humanities	38
Psychology Educational	19	Psyhology	38
History Philosophy of Science	18	Computer Science	20
Philosophy	14	Medicine	10
Multidisciplinary Sciences	12	Engineering	13
Computer Science İnterdisciplinary Applications	6	Physics and Astronomy	12
Education Scientific Disciplines	6	Mathematics	9
Engineering Electrical Electronic	6	Business, Management and Accounting	8
Humanities Multidisciplinary	5	Economics, Econometrics and Finance	8

According to Table 1, while the scientific creativity studies in the WoS database are in the "Education/Educational Research" category with the highest number of studies (N=43), there are 81 studies on scientific creativity in the "Social Sciences" category in the Scopus database. In the WoS database, the "Psychology Multidisciplinary" and "Psychology Educational" categories also show that scientific creativity studies are higher than other categories. In the Scopus database, it was concluded that scientific creativity studies in the categories “Art and Humanities” and “Psyhology” were more than other categories. These results show that scientific creativity works are generally in the categories “Education/Education Research” and “Social Sciences”. In addition, the fact that scientific creativity studies in the domain of psychology rank second in both databases show that scientific creativity is an interdisciplinary subject. At least the number of studies related to scientific creativity in the WoS database leads to the finding that the number of studies in interdisciplinary practice in the domain of “Humanities Multidisciplinary”. The minimum published category of scientific creativity in the Scopus database was found to be “Economics, Econometrics and Finance”.

Most Cited Studies in Scientific Creativity

The 10 most cited sources in the WoS and Scopus databases in the studies on scientific creativity obtained as a result of the analyzes within the scope of the second subproblem of the research are presented below. (See Table 2).

Table 2.

Top 10 Most Cited Sources for Scientific Creativity Studies in WoS Database and Scopus Database

İnformation of Studies (Wos Database)	**Total Citations**	**İnformation of Studies (Scopus Database)**	**Total Citations**
Scientific creativity as constrained stochastic behavior: the integration of product, person, and process perspectives. (Simonton, D.K., 2003)	367	Scientific creativity as constrained stochastic behavior: The integration of product, person, and process perspectives. (Simonton, D.K., 2003)	438
A scientific creativity test for secondary school students. (Hu, W. & Adey, P., 2002)	129	A scientific creativity test for secondary school students.(Hu, W. & Adey, P., 2002)	159
Creativity. (Simonton, D.K., 2009)	106	Age dynamics in scientific creativity. (Jones, B.F. & Weinberg, B.A., 2011)	100
Age dynamics in scientific creativity. (Jones, B.F. & Weinberg, B.A., 2011)	90	Ability differences among people who have commensurate degrees matter for scientific creativity. (Park, G., Lubinski, D. & Benbow, C.P., 2008)	96
Ability differences among people who have commensurate degrees matter for scientific creativity. (Park, G., Lubinski, D. & Benbow, C.P., 2008)	84	General, artistic and scientific creativity attributes of engineering and music students. (Chartyon, C. & Snelbecker, G.E., 2007)	61
The janusian process in scientific creativity. (Rothenberg, A., 1996)	74	Increasing students' scientific creativity: the "learn to think" intervention program. (Hu, W., Wu, B., Jia, X., Yi, X., Duan, C., Meyer, W. & Kaufman, J.C., 2013)	58
General, artistic and scientific creativity attributes of engineering and music students. (Chartyon, C. & Snelbecker, G.E., 2007)	47	The relative influences of domain knowledge and domain-general divergent thinking on scientific creativity and mathematical creativity. (Huang, P.S., Peng, S.L., Chen, H.C., Tseng, L.C. & Hsu, L.C., 2017)	38

Increasing students' scientific creativity: the "learn to think" intervention program. (Hu, W., Wu, B., Jia, X., Yi, X., Duan, C., Meyer, W. & Kaufman, J.C., 2013)	44	The influence of CAI on scientific creativity. (Lin, C., Hu, W., Adey, P. & Shen, J., 2003)	36
Objective measure of scientific creativity: psychometric validity of the creative scientific ability test. (Ayas, M.B. & Sak, U., 2014)	32	Objective measure of scientific creativity: psychometric validity of the creative scientific ability test. (Ayas, M.B. & Sak, U., 2014)	35
Veblen on scientific creativity: the influence of Charles S. Peirce. (Dyer, A.W., 1986)	31	Effectiveness of creative responsibility based teaching (crbt) model on basic physics learning to increase student's scientific creativity and responsibility. (Suyidno, S., Nur, M. & Yuanita, L., 2018)	32

When table 2 is reviewed, the article entitled "Scientific creativity as constrained stochastic behavior: The integration of product, person, and process perspectives" published by Simonton, D.K. (2003) has 367 references in the WoS database, while 4[illegible] references to the same article are made in the Scopus database. Because of the high interest in a study, the study is comprehensive in the field of scientific creativity. Thereupon, the study titled "a scientific creativity test for secondary school students" published by Hu, W. & Adey, P. (2002) second most reference field article in both the WoS database (1[illegible] references) and the Scopus database (159 references) and it is shown that the effective study in scientific creativity. The researchers who contribute to scientific creativity are more detailed as part of the third subproblem of the research.

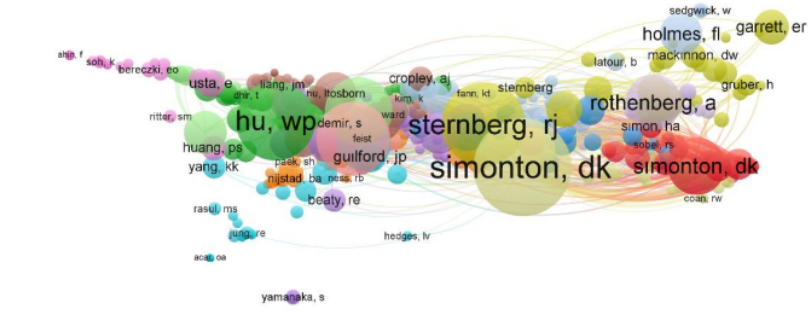
Researchers Contributing to Scientific Creativity Studies

a) Most Cited Authors in Scientific Creativity Studies

Within the scope of the third subproblem of the research, the authors who have studied on scientific creativity were analyzed. Firstly, the most cited authors in studies on scientific creativity were analyzed. Images obtained from the analysis of WoS and Scopus databases are presented below. (See Figure 2 and Figure 3).

Figure 2

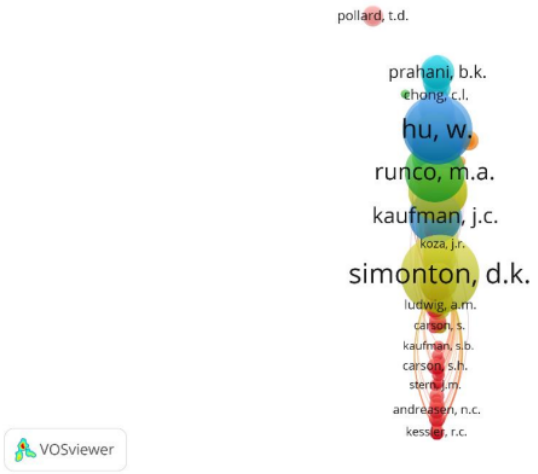
Most Cited Authors on Scientific Creativity Studies in WoS Database



As the size of the nodes in the figure shows, the most common reference authors in scientific creativity studies in the WoS database are Simonton, D.K., Hu, W., Sternberg, R.J., Runco, M.A., and Torrance, E.P.

Figure 3

Most Cited Authors on Scientific Creativity Studies in Scopus Database



Analysis of the most cited authors in the Scopus database, as the size of their nodes shows; Simonton, D.K., Hu, W., Adey, P., Sternberg, R.J., Runco, M.A., and Kaufman, J.C. The fact that the most cited authors in both databases are partners shows that they are doing effective work in scientific creativity studies.

b) Authors with the Most Studies in Scientific Creativity Studies

Within the scope of the third subproblem of the research, secondly, the top 10 authors who published the most on scientific creativity in both databases were analyzed. The authors and number of studies are given in Table 3.

Table 3

Top 10 Number of Authors and Publications Contributing to the Field Most Within the Scope of Scientific Creativity Studies in WoS Database and Scopus Database

Author (WoS Database)	**Number of Study**	**Author (Scopus Database)**	**Number of Study**
Siew, Nyet Moi	5	Siew, Nyet Moi	5
Adey, Philip	3	Hu, Weiping	4
Simonton, Dean Keith	3	Park, Jongwon	4
Suyidno, M. Nur	3	Huang, Chin-Fei	3
Nur, Mohamad	3	Astutik, Sri	3
Sahin, Fatma	3	Lin, Huann-Shyang	3
Park, Jongwon	3	Prahani, Binar Kurnia	3
Huang, Chin-Fei	3	Simonton, Dean Keith	3
Jones, Benjamin F.	2	Holmes, Frederic Lawrence	3
Rothenberg, Albert	2	Adey, Philip	2

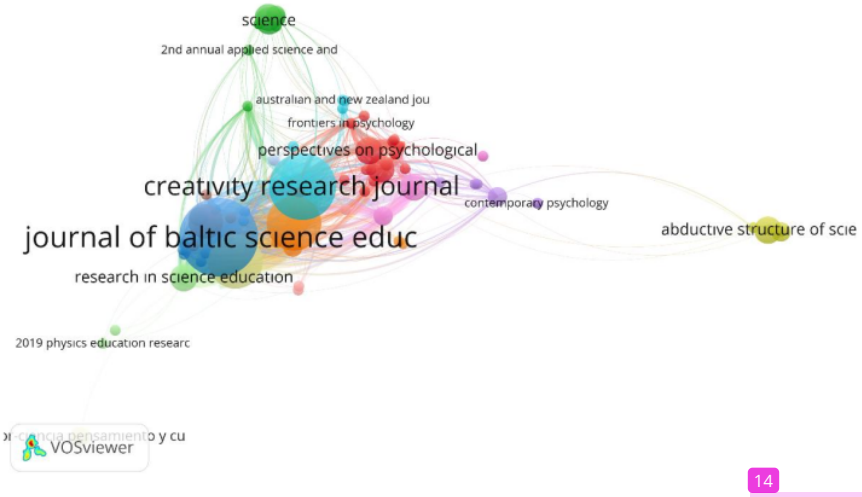
When Table 3 is examined, it is seen that N.M Siew, one of the authors who contributed the most to the field, has 5 studies registered in both databases. In the scientific creativity studies, in the WoS database; P.Adey, D.K. Simonton, M.N. Suyidno, M. Nur, F. Sahin, J. Park, and C-H. Huang (3 articles each) was found to be the second most influential scientists. In the Scopus database; W. Hu v J. Park (4 articles each) was determined to be the second-ranked authors contributing to the field. Most of the scientific creativity studies consist of more than one author. It has been determined that the number of studies with a single author is low.

Active Journals in Scientific Creativity Studies

Within the scope of the fourth subproblem of the current study, it was determined in which journals the studies on scientific creativity were published in WoS and Scopus databases. Among the findings, the active journals in the WoS database and the Scopus database are given in Figure 4 and Figure 5.

Figure 4

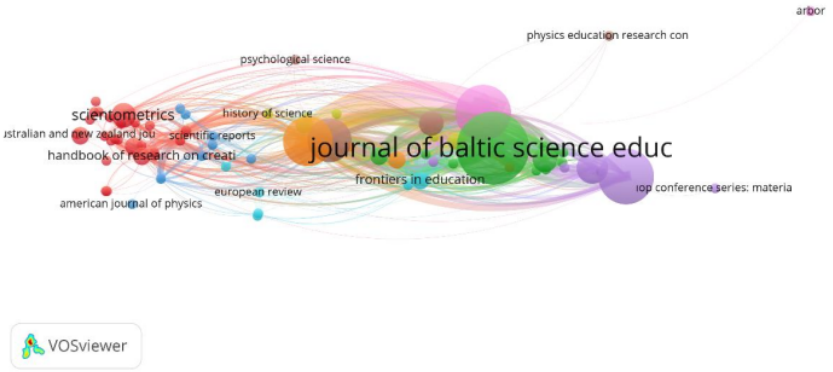
Active Journals Publishing on Scientific Creativity in WoS Database



In the examination, it is seen that scientific creativity studies are mostly published in the "Journal of Baltic Science Education" in the WoS database. This is followed by "Creativity Research Journal", "Journal of Creative Behavior", "Thinking Skills and Creativity" and "International Journal of Psychology".

Figure 5

Active Journals Publishing on Scientific Creativity in Scopus Database



It is seen that the most studies on scientific creativity in the Scopus database were published in the "Journal of Baltic Science Education", similar to the WoS database. When the

sizes of the nodes in the figure are examined, the other journals that publish more in the field are "Thinking Skills and Creativity", "Journal of Physics: Conference Series", "Creativity Research Journal" and "Journal of Creative Behavior".

The top 10 journals with the most active publications on scientific creativity in both databases are given in Table 4.

Table 4

Top 10 Journals Active in the Scope of Studies Published on Scientific Creativity Studies in WoS Database and Scopus Database

Journals of Articles Published (WoS Database)	N	Journals of Articles Published (Scopus Database)	N
Journal of Baltic Science Education	11	Journal of Baltic Science Education	11
Creativity Research Journal	9	Thinking Skills and Creativity	8
Journal of Creative Behavior	7	Journal of Physics: Conference Series	8
Thinking Skills and Creativity	7	Creativity Research Journal	7
International Journal of Psychology	5	Journal of Creative Behavior	6
International Journal of Instruction	4	International Journal of Instruction	4
Perspectives on Psychological Science	3	Research in Science Education	3
Research in Science Education	3	Journal of Turkish Science Education	3
Scientometrics	3	Scientometrics	3
International Journal of Science Education	2	International Journal of Science Education	2

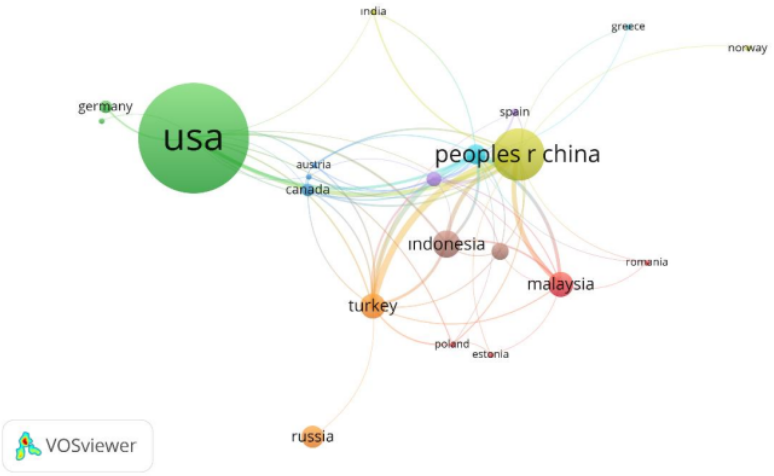
Eight journals (Journal of Baltic Science Education, Creativity Research Journal, Journal of Creative Behavior, Thinking Skills and Creativity, International Journal of Instruction, Research in Science Education, Scientometrics, and International Journal of Science Education) scanned in both databases. It has been determined that it is among the top 10 journals that publish the most in creativity studies. Publication of studies in different journals shows that there are alternatives to the journals in which the studies can be published and that the studies are not collected in a single journal.

Active Countries in Scientific Creativity Studies

Within the scope of the fifth subproblem of the research, countries operating in scientific creativity studies were analyzed. Images obtained from the analysis of WoS and Scopus databases are presented below. (See Figure 6 and Figure 7).

Figure 6

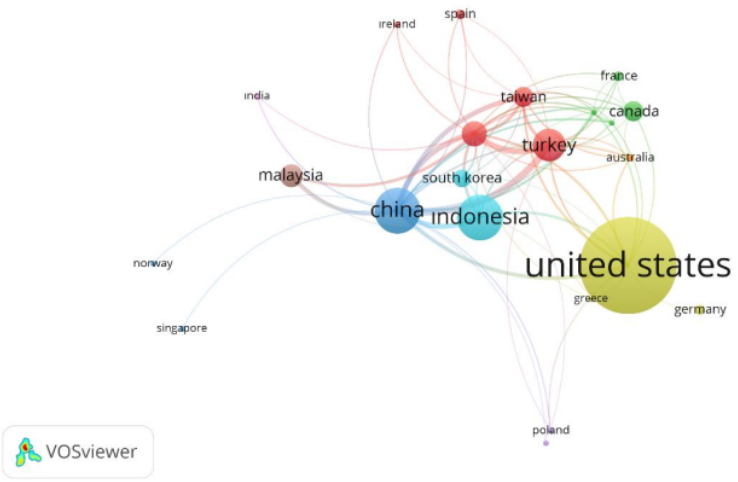
Active Countries on Scientific Creativity Studies in WoS Database



When Figure 6 is examined, it was seen that the most studies on scientific creativity in the WoS database were published in the United States. In this regard, it has been concluded that the USA is followed by China, Indonesia, Turkey and Malaysia.

Figure 7

Active Countries on Scientific Creativity Studies in Scopus Database



In the Scopus database, it was seen that the most studies on scientific creativity were published in the United States. It has been concluded that the USA is followed by China, Indonesia, Turkey and the United Kingdom in this regard.

Table 5 shows the top 10 countries with the most scientific publications in the WoS database and the Scopus database, and the number of citations.

Table 5

Countries Effective Within the Scope of Published Studies Related to Scientific Creativity

Country / Region (WoS Database)	N	Citations	Country / Region (Scopus Database)	N	Citations
United States of America	44	917	United States of America	38	942
China	21	267	China	18	341
Indonesia	11	73	Indonesia	18	130
Turkey	10	69	Turkey	13	57
Malaysia	10	34	United Kingdom	10	244
Russian Federation	9	4	Malaysia	9	44
United Kingdom	8	166	Taiwan	8	86
South Korea	7	12	Canada	8	23
Taiwan	6	68	South Korea	7	16
Italy	6	0	Russian Federation	7	0
Canada	5	13	Spain	4	28

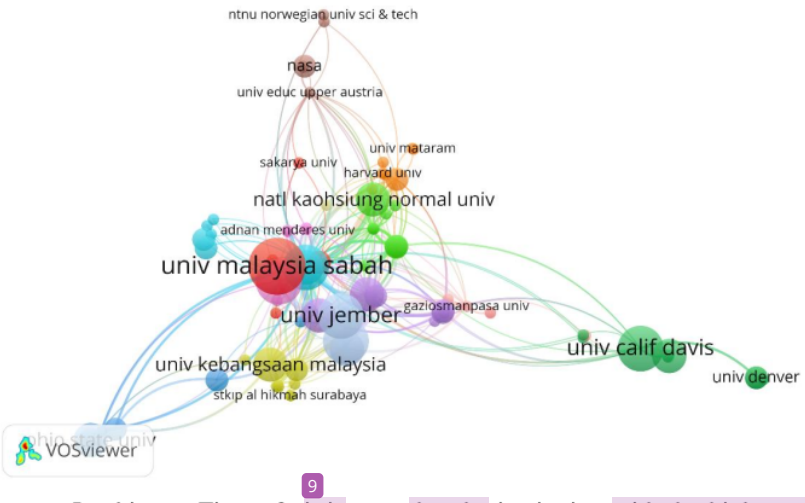
When the databases are compared, it is seen that the top 4 countries in both databases (United States of America, China, Indonesia and Turkey) have the highest number of documents and the highest number of citations in scientific creativity studies. It has been determined that Italy, which is among the top 10 countries in the document number of scientific creativity studies in the WoS database, has 0 citations. In the Scopus database, it was determined that the number of citations of the Russian Federation, which is among the top 10 countries in the number of documents of scientific creativity studies, is 0.

Active Institutions in Scientific Creativity Studies

Within the scope of the sixth subproblem of the research, countries operating in scientific creativity studies were analyzed. Images obtained from the analysis of WoS and Scopus databases are presented below in Figure 8 and Figure 9.

Figure 8

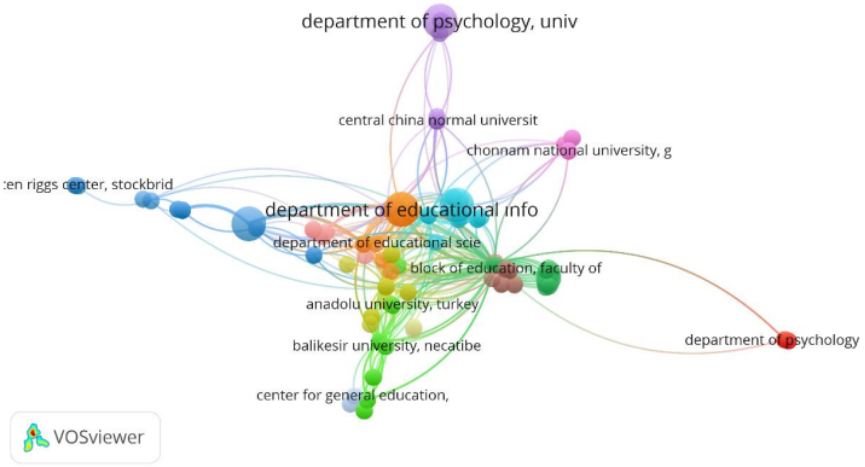
Active Institutions on Scientific Creativity in WoS Database



Looking at Figure 8, it is seen that the institution with the highest number of studies published is the University of Malaysia Sabah. It is followed by California State University and King's College London. Studies on scientific creativity in the WoS database, the fact that there are more connections and cooperation between the institutions that are actively operating show that the work efficiency in this field has increased.

Figure 9

Active Institutions on Scientific Creativity in Scopus Database



According to Figure 8, the institution that has done the most study on scientific creativity in the Scopus database has been determined as the "University of Jember". It is followed by "East China Normal University", "University of Cambridge", "KTH Royal Institute of Technology", "Jönköping International Business School".

The number of documents and citations by the top 10 institutions active in scientific creativity in both databases are displayed in Table 6.

Table 6

Top 10 Active Institutions in Scientific Creativity Studies

Institutions (WoS Database)	N	Citations	Institutions (Scopus Database)	N	Citations
University of Malaysia Sabah	5	30	University of Jember	2	11
California State University	4	485	East China Normal University	2	11
King's College London	4	159	University of Cambridge	2	2
University of Jember	4	34	KTH Royal Institute of Technology	2	2
Peking University	4	31	Jönköping International Business School	2	28
Surabaya State University	4	19	National Kaohsiung Normal University	2	1
Russian Academy of Sciences	4	0	Kazan Federal University	2	0
Shanxi University	3	157	Western University	2	2

Ohio State University	3	137	King's College London	1	159
Marmara University	3	11	Shanxi University	1	159

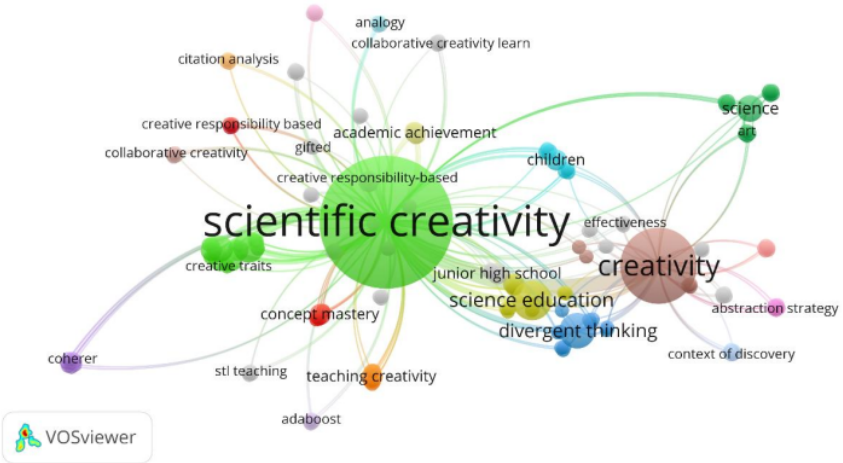
When Table 6 is studied, it is seen that institutions are mostly different in studies on scientific creativity in the WoS database and the Scopus database. When the institutions in the WoS database were examined, it was determined that the most documents related to scientific creativity were found in University of Malaysia Sabah (N=5), but the number of citations (citation: 30) was less than the number of documents. It is seen that the number of citations (citation: 485) is higher than the number of documents (N=4) of California State University. Similarly, it was determined that the number of documents low, but the number of citations was high at Shanxi University (N=3; citation:157) and Ohio State University (N=3; citation:137). When the active institutions on scientific creativity in the Scopus database are examined; It was determined that the number of citations higher than the number of documents at King's College London (N=1; citation:159) and Shanxi University (N=1; citation:159)

Keywords Preferred By Authors in Studies Related to the Scientific Creativity

The keywords used in studies on scientific creativity related to the seventh subproblem of the research were analyzed. The analysis results obtained in this context are given below in Figure 10 and Figure 11.

Figure 10

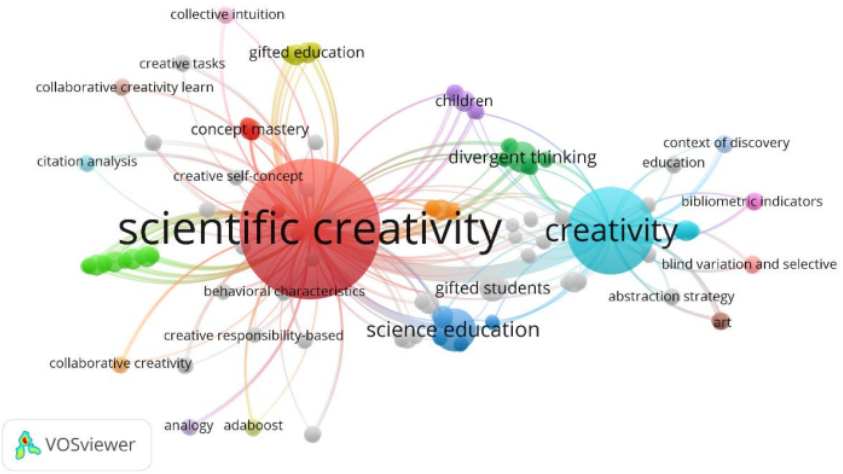
Most Relevant Keywords in WoS Database



When the nodes were examined, it was determined that the most used keywords in the studies in the WoS database were "scientific creativity, creativity, science education, divergent thinking".

Figure 11

Most Relevant Keywords İn Scopus Database



When the nodes in Figure 11 are examined, it has been determined that the most used keywords in the studies in the Scopus database are "scientific creativity, creativity, science education, divergent thinking".

The analysis of the top 10 most used keywords in scientific creativity studies in WoS and Scopus databases is given below. (See Table 7).

Table 7

Top 10 Keywords on Scientific Creativity Studies in WoS Database and Scopus Database

Analysis of Top 10 Keywords (WoS Database)	N	Analysis of Top 10 Keywords (Scopus Database)	N
scientific creativity	50	scientific creativity	55
creativity	19	creativity	24
science education	6	science education	7
divergent thinking	5	divergent thinking	4
stem	4	Gifted students	3
science	3	children	2
cooparative learning	3	cooparative learning	2
children	2	problem based learning	2
pre-schoolers	2	effecteness	2
problem based learning	2	steam	2

According to the analysis, it has been determined that the words "scientific creativity, creativity, science education, divergent thinking" are the most used keywords in scientific creativity studies in both databases. It has been concluded that the keywords used in studies on scientific creativity are similar in the two databases, and the words "cooparative learning, children, problem-based learning" are among the top 10 most used keywords.

Discussion And Conclusion

In this study, studies on scientific creativity from 1975 to 2021 in the WoS and Scopus databases were analyzed by bibliometric analysis. The collective results of the findings from both databases are presented below.

The study on scientific creativity has been found to be in the most education/educational research and social science categories. The development of scientific creativity through education (Rasul et al., 2018) and the increase in studies in order to be supported by different learning-learning approaches (take Astutik meat, 2020; Karademir, 2016; Kozhevnikov et al., 2021) explains the reason why the education/education research and social sciences categories were first ranted.

Both databases found that the most cited study was “the integration of product, person, and process perspectives” published by Dean Keith Simonton in 2003.

According to another conclusion of the study, both databases found that Nyet Moi Siew (5 studies) was the most published author of scientific creativity. The most cited authors for their studies in the field of scientific creativity are “Simonton, D.K., Hu, W., Sternberg, R.J., Runco, M.A., Torrance, E.P. and Kaufman, J.C.” has been determined. It can be concluded that the most cited authors are active in scientific creativity and conduct studies that the field-leading way.

According to the results of another analysis, it was determined that the journal that published the most studies on scientific creativity was the Journal of Baltic Science Education in both databases. Following this, it was revealed that the Creativity Research Journal and Thinking Skills and Creativity journals have substantial studies on scientific creativity. It has been concluded that these journals are competent and active journals in the field of scientific creativity. As another result of the research, it was determined that the countries with the most studies on scientific creativity were United States of America, China, Indonesia and Turkey in both databases. It has been concluded that the number of citations is higher in all four countries depending on the number of studies. Another finding obtained showed that although the number of studies in United Kingdom was low in both databases, the number of citations was high. This result shows that the United Kingdom has made essential studies in the field of scientific creativity. The obtained finding is similar to the findings of the study that analyzed different dimensions of scientific creativity studies (Saptono and Hidayah, 2020).

The results of the analysis show that University of Malaysia Sabah is the institution with the most scientific creativity studies in WoS database. In the Scopus database, it has been determined that the University of Jember has more studies on scientific creativity than other institutions. Also, institutions with the highest number of citations were determined as California State University, King's College London, Shanxi University, Ohio State University.

This finding shows that institutions carry out effective studies on scientific creativity, even though the number of studies is low.

When the findings of the last subproblem of the research were examined, it was concluded that the words "scientific creativity, creativity, science education, divergent thinking" in both databases were the most used keywords in scientific creativity studies.

In this study, the top 10 that stand out in the studies on scientific creativity in the WoS database and the Scopus database were examined. In this context, the limitation of the study is the studies in the WoS and Scopus databases. As a continuation of this work, researchers can conduct bibliometric analyzes of scientific creativity using other existing databases or by incorporating further studies into their research.

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