Bibliometric Analysis of Studies on Higher Order Thinking Skills in the Web of Science Core Collection (WoSCC) Database

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To cite this article:

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Article Info	Abstract
	The aim of this study is to make a bibliometric analysis of the articles on higher order thinking skills in the Web of Science Core Collection (WoSCC) database. Since the research topic has a universal dimension, it is considered important to describe the current situation as it will add a broader perspective to future studies on higher order thinking skills. Bibliometric analysis method was used to examine the articles on higher order thinking skills in the Web of Science Core Collection (WoSCC) database in terms of various variables. In this study, for bibliometric mapping analysis, the Web of Science Categories database was extensively searched on 17.09.2024, including the years 1970/2024 and under the subject headings "Metacognitive thinking skills" (Topic) or "Reflective thinking skills" (Topic) or "Creative thinking skills" (Topic) or "Critical thinking skills" in the search query. In the process of data analysis, descriptive characteristics of the studies on thinking skills were determined and the most effective journals on high-level thinking skills were identified. In addition, in the process of data analysis, the sources were categorized according to Bradford's law and the most cited articles worldwide were determined. On the other hand, the most influential authors on higher order thinking skills and the most frequently used keywords related to the subject together with the influential countries according to scientific production and citations were determined, and current research topics related to higher order thinking skills were identified.

Introduction

Today, all developed and developing societies have started to put forward raising individuals with high-level thinking skills through their education systems as an increasingly prioritized and important vision while building their future. Modern life now aims to raise individuals who can think in multiple ways, build new and different ideas, and are in a continuous thinking process against the events and phenomena emerging in their own world and around them, instead of individuals who think, research and analyze in one direction. In addition, in this process, raising individuals who are aware of their own learning processes, plan and organize their experiences, transfer and transfer them to new situations by using the knowledge and experiences they have learned is an

inevitable goal of educational processes.

Fisher (2006) points out that the goal of education is to enable children to transfer knowledge to their daily lives by using their thinking skills and states that thinking skills are the mental capacities that individuals use to investigate the world, solve problems and make judgements. Petscher (2010) draws attention to the need to plan the education and training process very well in order to raise individuals with higher order thinking skills and states that individuals with higher order thinking skills can effectively use mental processes such as critical thinking, questioning, analyzing, evaluating and problem solving. Research on the results of higher-order thinking skills in educational activities shows that they produce positive results in students' learning performance (Pogrow, 2005) and motivation (Meece, 2003; Carrol & Leander, 2001).

Yıldırım & Benzer (2023), While skills such as critical thinking, problem solving, creative thinking, analytical thinking, reflective thinking, metacognitive thinking constitute high-level thinking skills, the theoretical knowledge required to use these skills constitute low-level thinking skills. Since life has a process that includes various phenomena, the individual should be able to analyze and evaluate these phenomena, cope with the problems they face, and transfer their experiences to new situations (Moon, 2004; Sarikaya, 2018; Gavaz, 2015; Adair, 2015). For this, they should have creative, critical and reflective thinking and problem solving skills (Söylemez, 2018).

Senemoğlu (2009) states that creativity involves original, flexible and fluent thinking in different situations. Critical thinking is defined by Güven and Kürüm (2006) as a complex and comprehensive process that requires high-level cognitive skills, while Hotaman (2008) defines it as reaching conclusions based on observation and knowledge. Reflective thinking, which is one of the high-level thinking skills, is a process in which "Reflection is a process in which experiences/experiences are reconstructed and comments are made on them" (Stevens & Cooper, 2009). In the 21st century, education and training activities aim not only to equip individuals with knowledge but also to provide them with skills on how to behave in different situations that individuals may encounter in their lives (Olukcu & Yıldız, 2022). Higher-order thinking skills are the cognitive capacity to go beyond the given information to categorize, infer, generalize and solve problems in complex situations (Lewis & Smith, 1993) and come into play when individuals encounter unusual problems, uncertainties, questions or dilemmas (Mainali, 2012). There are many different views in the literature about which thinking skills higher-order thinking covers (Öz, 2023).

Answering the questions about what are the descriptive characteristics of the studies on "higher order thinking skills" in the "Web of Science (WoS)" database, which includes scientific studies accepted as "important, high quality" in the world, and what are the current research topics related to them is very important both in terms of the studies to be conducted on higher order thinking skills and in terms of drawing a new vision for researchers who are considering doing research on this subject. Since the research topic has a universal dimension, it is considered important to describe the current situation as it will add a broader perspective to the future studies on higher order thinking skills.

The aim of this study is to conduct a bibliometric analysis of the articles on higher order thinking skills in the Web of Science Core Collection (WoSCC) database. In line with this purpose, the following sub-objectives were sought.

1. What are the descriptive characteristics of the articles on higher order thinking skills?
2. Which are the most effective journals that contain scientific articles on higher order thinking skills?
3. How is the distribution of the sources of articles published in the field of higher order thinking skills categorized according to Bradford's law?
4. Which are the most cited papers on higher order thinking skills worldwide?
5. Who are the most influential scientists with publications in the field of higher order thinking skills?
6. When the studies published in the field of higher order thinking skills are evaluated according to scientific production and citations, which countries are effective?
7. What are the most frequently used keywords in articles published in the field of higher order thinking skills?
8. What are the current research topics in articles published in the field of higher order thinking skills?

Method

Research Design

In this study, bibliometric analysis method was used to examine the articles on higher order thinking skills in the Web of Science Core Collection (WoSCC) database in terms of various variables. Bibliometric analysis is a reliable technique that investigates critical aspects and emerging issues in a particular field (Hood & Wilson, 2001; Donthu., Kumar., Mukherjee., Pandey., & Lim., 2021). Bibliometric mapping is a spatial representation of the relationships between disciplines, fields, individual publications or authors (Small, 1999). This method helps researchers understand these relationships by visually representing the links between key concepts in a research topic (Heersmink., Hoven, J., & van Berg, 2011). Bibliometric analysis enables to follow the studies, researchers, institutions and scientific flow related to the determined scientific subject (Martí-Parreño., Méndez-Ibáñez., & Alonso-Arroyo, 2016).

Data Set

Using data from different databases in bibliometric evaluation studies may lead to different results (Singh et al., 2021). Therefore, it is important to select the appropriate database. In this study, for bibliometric mapping analysis, the Web of Science Categories database was extensively searched on 17.09.2024, including the years between 1970 and 2024 and under the subject headings "Metacognitive thinking skills" (Topic) or "Reflective thinking skills" (Topic) or "Creative thinking skills" (Topic) or "Critical thinking skills" in the search query. Scopus was specifically selected because of its wide acceptance in academia as a comprehensive bibliographic database (Zhu & Liu, 2020), publishing research articles with strong theoretical and scientific foundations. On 17 September 2024, a search was conducted using the title and keywords "metacognitive thinking skills" or "reflective thinking skills" or "creative thinking skills" or "critical thinking skills" in the search query in the Web of Science Core Collection (WoSCC) database. In the first search, a total of 174163 sources on the subject were

reached. Then, a final data set consisting of 5104 records was obtained by filtering the document type as article and language (English).

Table 1. Study Steps

Search of the Web of Science Core Collection (WoSCC) database on 17 September 2024.
Search in the fields "title", " and "keywords" using the following keywords.
("Metacognitive thinking skills" and "Reflective thinking skills" and "Creative thinking skills" and "Critical thinking skills")
Filtering the total number of sources accessed by article document type.
Filtering into English language
Reaching 5104 studies

Data Analysis

In the data analysis process, the descriptive characteristics of the studies on thinking skills were determined and the most effective journals on higher order thinking skills were identified. In addition, in the process of data analysis, sources were categorized according to Bradford's law and the most cited articles worldwide were determined. On the other hand, the most influential authors on higher order thinking skills and the most frequently used keywords related to the subject together with the influential countries according to scientific production and citations were determined, and current research topics related to higher order thinking skills were identified.

Results

When Table 2 is analyzed, it is seen that 5104 of the publications obtained from 174163 different sources have been published as articles starting from 1970 until today. It was determined that 784 of these publications were published in journals as a source. While there is an annual increase of 12.32% in the number of publications, the average citation rate per document is 13.1. In these studies in which 12228 authors took part, the number of single-author documents was 1344. It was determined that the number of keywords in WoS related to higher order thinking skills was 10437.

Source Impact and Bradford Law were used to identify core journals in this field. Table 3 lists the journals according to their g-index, h-index, m-index, total citations (TC) and net production (NP) values. The three most influential sources, which are a measure at the author level (according to g-index, h-index and m-index), are Thinking Skills And Creativity, (g-index:56; h-index:36; m-index:1895); Computers & Education (g-index:59; h-index:34; m-index:1097) and Bmc Medical Education (g-index:28; h-index:21; m-index:1235). The journals with the highest total number of citations were Thinking Skills And Creativity (TC:5551), Computers & Education (TC:3537) and Higher Education (TC:1219). In addition, the top three journals according to net production (NP) values are Thinking Skills And Creativity (NP:344); International Journal Of Instruction (NP:132) and Bmc

Medical Education (NP:95).

Table 2. Descriptive Characteristics of Studies on Thinking Skills

Description	Results
Time Interval	1970:2024
Sources (Journals)	784
Number of Articles	5104
Annual Growth Rate (%)	12.32
Average Citation Amount per Article	13.1
Total Number of Sources	174163
WoS Keyword Count	2898
Author Keyword Count	10437
Number of Single Authored Articles	1344
Total Number of Authors	12228

Table 3. Names of the Most Influential Magazines and Source Influence

Sources	g_index	h_index	m_index	TC	NP
Thinking Skills And Creativity	56	36	1895	5551	344
Computers & Education	59	34	1097	3537	73
Bmc Medical Education	28	21	1235	1078	95
International Journal Of Instruction	26	19	1118	1169	132
British Journal Of Educational Technology	25	17	654	688	34
International Journal Of Science Education	34	17	708	1164	38
Nursing Education Perspectives	27	17	0.85	832	55
ETR\&D-Educational Technology Research and Development	30	16	727	935	41
Higher Education	28	16	533	1219	28
Instructional Science	27	16	516	1102	27

Table 4 shows the ten highest ranked resources that divide the journals into three regions according to Bradford's Law. Out of the 784 journals analysed, 1 was identified as the course resources in Region 1. In the studies on higher order thinking skills, the journal Thinking Skills And Creativity is in the first region with its citation frequency (F:344). In addition, 3 sources International Journal Of Instruction (F:132); Education Sciences (F:108) and Bmc Medical Education (F:95) were placed in Region 2 and 6 sources Frontiers In Education (F:88); Education And Information Technologies (F:86); Computers \& Education (F:73); Teaching Of Psychology (F:67); Nursing Education Perspectives (F:55) and Eurasian Journal Of Educational Research (F:46) were placed in Region 3.

Table 4. Sources Categorized According to Bradford's Law

Sources	F	CF	Region
Thinking Skills And Creativity	344	344	Zone 1
International Journal Of Instruction	132	476	
Education Sciences	108	584	
Bmc Medical Education	95	679	
Frontiers In Education	88	767	
Education And Information Technologies	86	853	
Computers \& Education	73	926	
Teaching Of Psychology	67	993	
Nursing Education Perspectives	55	1048	
Eurasian Journal Of Educational Research	46	1094	

Note: F = Citation frequency, CF = Cumulative citation frequency.

The 10 most cited articles on metacognitive thinking skills (metacognitive thinking skills or reflective thinking skills or creative thinking skills or critical thinking skills) among the articles published in Web of Science are given in Table 5. The most cited article in the international arena (Binkley, M. 2012). "Defining Twenty-First Century Skills. Assessment and teaching of 21st century skills/Springer" (F: 735), followed by (Rodgers, C. 2002) "Defining reflection: Another look at John Dewey and reflective thinking" (F: 720). (Zohar, A., & Nemet, F. 2002). "Fostering students' knowledge and argumentation skills through dilemmas in human genetics" (F:677). Then, according to the frequency of citation numbers, these articles were followed by (Dignath, C. & Büttner, G. 2008). "Components of fostering self-regulated learning among students. A meta-analysis on intervention studies at primary and secondary school level" (F:535) and (Fischer et al., 2007). Why mind, brain, and education? Why now?" (F:510).

Table 5. Most Cited Articles Worldwide

Author	Year	Source	TC	NTC	DOI
Binkley, M.	2012	ASSESSMENT AND TEACHING OF 21ST CENTURY SKILLS	735	29.75	10.1007/978-94-007-2324-5_2
Rodgers, C.	2002	TEACH COLL REC	720	5.59	10.1111/1467-9620.00181
Zohar, A.	2002	J RES SCI TEACH	677	5.26	10.1002/tea.10008
Dignath, C.	2008	METACOGN LEARN	535	16.31	10.1007/s11409-008-9029-x
Immordino-Yang, M. H.	2007	MIND BRAIN EDUC	510	16.88	10.1111/j.1751-228X.2007.00004.x
Razzouk, R.	2012	REV EDUC RES	476	19.26	10.3102/0034654312457429
Kelchtermans, G.	2009	TEACH TEACH	457	13.47	10.1080/13540600902875332
Zeidler, D. L.	2002	SCI EDUC	368	2.86	10.1002/sce.10025
Terenzini, P. T.	1996	RES HIGH EDUC	361	5.25	10.1007/BF01680039
Abrami, P. C.	2015	REV EDUC RES	341	20.83	10.3102/0034654314551063

Note: F= Citation frequency CF= Cumulative citation frequency.

When Table 6 is analyzed, the author with the highest number of publications, h_index; g_index and m index values related to "metacognitive thinking skills or reflective thinking skills or creative thinking skills or critical thinking skills)" in Web of Science is Hwang G.J (h_index=17, g_index=30, m index=1.889), while the most cited author in total average is Pascarella e.t all. (TC=1037).

Table 6. Most Influential Authors

Author	h_index	g_index	m_index	TC	NP
HWANG GJ	17	30	1889	926	40
PASCARELLA ET	15	20	0.5	1037	20
YANG YTC	11	13	0.55	752	13
TSAI CC	8	11	333	372	11
ZOHAR A	8	8	258	1019	8
CHANG CY	7	8	1167	157	8
DE BRUIN LR	6	6	857	120	6
DWYER CP	6	6	462	403	6
ELEN J	6	8	0.5	166	8
LI Y	6	12	667	163	13

Note: TC=Total attribution, NP=Net production.

When Table 7 is examined, the countries and organizations with the highest number of publications, the highest number of citations and the most productive ones related to metacognitive thinking skills or reflective thinking skills or creative thinking skills or critical thinking skills in Web of Science are listed in Table 7. It was found that the top three countries in scientific productivity on the subject were the United States of America (f:3815); China (f:1579) and the United Kingdom (UK-f: 896). It is seen that USA (TC:22907); China (TC:6916) and Austria (TC:4880) are in the top three of the most cited countries related to higher order thinking skills.

Table 7 shows the top 10 universities with the highest number of publications on "metacognitive thinking skills or reflective thinking skills or creative thinking skills or critical thinking skills" in the Web of Science database. The top 10 universities that published on the subject produced a total of 738 articles. The most published university is National Taiwan University of Science and Technology (ArtN=98), followed by National Taiwan Normal University (ArtN=91) and Monash University (ArtN=89).

Table 7. Influential Countries by Scientific Production and Citations

Scientific Production		Most Cited Countries		Relevant Affiliation	
Country	f	Country	TC	Organization	Articles
USA	3815	USA	22907	Natl Taiwan Univ Sci and Technol	98
CHINA	1579	CHINA	6916	Natl Taiwan Normal Univ	91
UK	896	AUSTRALIA	4880	Monash Univ	89
AUSTRALIA	895	UNITED KINGDOM	4758	Educ Univ Hong Kong	80
TURKEY	718	TURKEY	2610	Univ Negeri Malang	72

INDONESIA	670	CANADA	2434	Nanyang Technol Univ	66
SPAIN	554	ISRAEL	2267	Natl Cheng Kung Univ	66
MALAYSIA	396	SPAIN	1474	Univ Melbourne	61
CANADA	380	NETHERLANDS	1360	Islamic Azad Univ	58
SOUTH AFRICA	276	INDONESIA	1245	Univ Hong Kong	57

In addition, it was determined that USA, which has the highest number of articles in the top 10 countries of the authors publishing in the field of "metacognitive thinking skills or reflective thinking skills or creative thinking skills or critical thinking skills" related to higher order thinking skills, is also the country with the highest number of single (SCP: 1200) and co-authored articles (MCP: 84). China, which is the second country with the highest number of articles on the subject, also ranks second in the number of articles with single author (SCP: 418) and in the number of multinational articles (MCP: 67). In addition, it was determined that United Kingdom ranked third in the number of articles with single author (SCP: 278) and third in the number of multinational articles (MCP: 48). It is noteworthy that Turkey, Indonesia, Spain, Canada, Malaysia, Malaysia, South Africa are among the top 10 countries with single author and multiple authors in relation to higher order thinking skills.
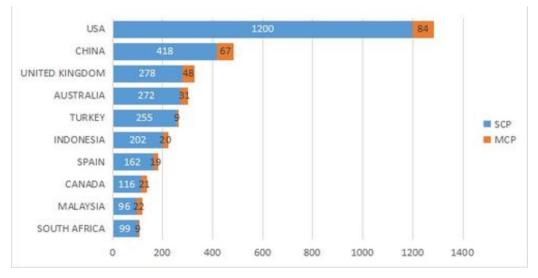

Figure 1. The Top 10 Countries of Authors in this Field

SCP: Single Country Publications

MCP: Multiple Country Publications

Basic Concepts of Research on Higher Order Thinking Skills

Based on an algorithm specific to Clarivate databases, KeyWords Plus increases the power of citation-reference searching by searching across disciplines for all articles with common references (Clarivate, 2022) . When Table 8 is analyzed, the 10 most repeated words from the KeyWord Plus created from articles related to higher order thinking skills in Web of Science are shown in Table 7. The 10 most repeated KeyWords Plus words in Table 8 are skills (f=646), education (f=602), students (f=527), knowledge (f=288), science (f=256), thinking (f=228), critical thinking (f=225), performance (f=222), model (f=178), impact (f=171).

Table 8. Most Frequently Used Keywords

Keywords Plus (ID)		Author's Keywords (DE)	
Words	f	Words	f
skills	646	critical thinking	986
education	602	education	284
students	527	creativity	264
knowledge	288	higher education	234
science	256	learning	229
thinking	228	thinking	129
critical thinking	225	creative thinking	128
performance	222	assessment	124
Model	178	metacognition	121
impact	171	skills	118

Note: f = Occurrences

In addition, the word categories formed with the 10 most repeated words among the keywords given by the authors in the articles are given in Table 8. When Table 8 is analyzed, it is seen that the 10 most repeated words are critical thinking (f=986), education (f=284), creativity (f=264), higher education (f=234), learning (f=229), thinking (f=129), creative thinking (f=128), assessment (f=124), metacognition (f=121), skills (f=118).

Current Research Topics

Under this heading, the relationships between terms are analyzed and light is shed on the field of higher order thinking skills. First, the findings from the co-occurrence network analysis are presented and then attention is shifted to the results from the thematic map analysis to understand future research trends.

Table 9. Keywords and Clustering Analysis

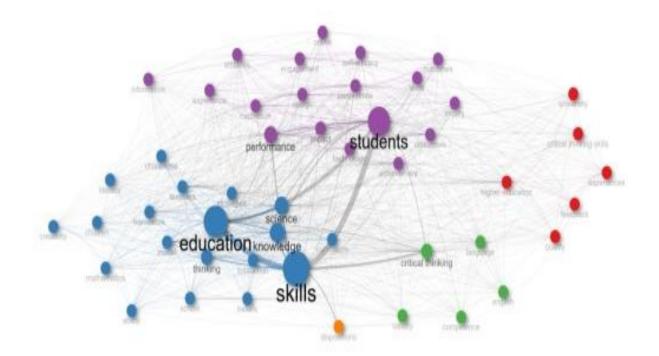| Cluster	Research stream	Nodes
Red	Higher Education and Critical Thinking Skills	higher-education, critical thinking skills, experiences, university, quality, feedback
Blue	Education, Information and Training Strategies	skills, education, knowledge, science, thinking, model, teachers, instruction, strategies, framework, curriculum, school, beliefs, children, literacy, creativity, mathematics, ability, challenges,
Green	Critical Thinking and Language Competences	critical thinking, validity, language, English, competence,
Purple	Performance, Motivation and Technology Supported Learning	students, performance, impact, perceptions, design, achievement, classroom, motivation, technology, engagement, self-efficacy, attitudes, inquiry, online, outcomes, experience, work, information,
Orange	Dispositions	dispositions

Figure 2. Co-Occurrence Network

Higher Education and Critical Thinking Skills

Among the keywords in this category, terms such as "higher-education," "critical thinking skills," "experiences," and "university" stand out. The research stream is considered to be related to the development of critical thinking skills at university level, student experiences and feedback processes. It is determined that it focuses on how critical thinking skills can be supported in the context of higher education in order to improve the quality of education.

Education, Information and Training Strategies

The keywords in this category include terms such as "skills," "education," "knowledge," "thinking," "teachers," "instruction" and "framework". In this stream, the focus is on knowledge acquisition, teaching methods and strategies in education in general. It includes research on the role of teachers, schools and teaching models in developing students' critical thinking skills. Disciplines such as science, mathematics and creativity were also identified as having an important place here.

Critical Thinking and Language Competences

 The keywords in this category include "critical thinking," "validity," "language," "English," and "competence" as key concepts in this group. The research stream focuses on how critical thinking skills are related to language learning and competences. In particular, the role of language competences and language in critical thinking is the main theme of this category.

Performance, Motivation and Technology Supported Learning

Among the keywords in this category, keywords such as "students," "performance," "impact," "motivation," "technology," "self-efficacy," and "engagement" stand out. The research was found to focus on studies examining students' academic achievement, motivation and self-efficacy in technology-supported learning environments. In addition, it is seen that the effects of classroom practices and digital technologies on learning are also addressed here.

Dispositions

Among the keywords in this category, "Dispositions" is the prominent keyword in this group. This stream focuses on students' information processing dispositions and attitudes in the learning process. The cognitive and affective dimensions of developing critical thinking skills can be the subject of research here.

Cluster Analysis

When Table 10 is examined, as a result of the clustering analysis of the authors, it is seen what the theme clusters in which the increasing subject areas and decreasing subject areas are included in the articles related to the field of higher order thinking skills.

Figure 3. Cluster Analysis

Table 10. Themes and IDs in the Thematic Map

Theme	ID's in cluster
Engine	Skills
	Education
	Students
Emerging or Declining	Knowledge
	Science
	Teachers

Discussion and Conclusion

In this study, it was aimed to conduct a bibliometric analysis of the articles on higher order thinking skills in the Web of Science Core Collection (WoSCC) database. Starting from 1970 until 2024, 5104 articles from 174163 different sources related to higher order thinking skills ("Metacognitive thinking skills" and "Reflective thinking skills" and "Creative thinking skills" and "Critical thinking skills") were published. Based on these results, it is possible to say that the subject area of higher order thinking skills is a scientific field of study that has maintained its popularity and currency from past to present.

In addition, when the names and source effect of the most effective journals related to higher order thinking skills are examined, it is understood that the journals in the first three ranks are "Thinking Skills And Creativity; Computers & Education and Bmc Medical Education". Based on these results, it is understood that the most effective journals for higher order thinking skills are journals publishing in the fields of thinking skills and creativity, computers and education and medicine.

On the other hand, it was determined that "Thinking Skills And Creativity" was in the first region according to the categorizations made to determine which of the journals published on a subject related to higher order thinking skills are core journals (Bradford's Law). Based on this result, it is possible to state that "Thinking Skills And Creativity" is a core journal that includes studies on higher order thinking skills.

However, when we look at the total number of citations in the international arena related to higher order thinking skills, the most cited author and article (Binkley, M. 2012). "Defining Twenty-First Century Skills. Assessment and teaching of 21st century skills/Springer" (f: 735), followed by (Rodgers, C. 2002) "Defining reflection: Another look at John Dewey and reflective thinking" (f: 720). (Zohar, A., & Nemet, F. 2002). "Fostering students' knowledge and argumentation skills through dilemmas in human genetics" (f:677).

In addition, it is understood that Hwang G.J & Pascarella et al. are the most frequently published scientists related to the subject area of higher order thinking skills. However, when analyzed in terms of the countries with the highest number of publications, the highest number of citations and the most productive countries in terms of metacognitive thinking skills or reflective thinking skills or creative thinking skills or critical thinking skills in Web of Science, it is seen that the USA has the highest number of publications, co-authored publications, single

and multiple national publications and cited articles in general. This is followed by China with the highest number of publications, the highest number of co-authored publications, single national publications and cited publications, and then by the UK with the highest number of publications, the highest number of co-authored publications, single national publications and cited publications. In addition, when the universities where the authors who published on higher order thinking skills worked are analyzed, it is understood that the most publications were made by the "National Taiwan University of Science and Technology". The second university with the highest number of publications on this subject is "National Taiwan Normal University (NTNU)".

On the other hand, it is seen that the keywords used in the studies on higher order thinking skills are the concepts of "skills, education, students". However, it was determined that the keywords used by the authors related to higher order thinking skills were "critical thinking, education, creativity". When we look at the frequently used keywords related to higher order thinking skills, it is possible to say that providing students with higher order thinking skills constitutes an important key point of education.

In addition, current research topics were identified by cluster analysis based on keywords related to higher-order thinking skills. As a result of the cluster analysis, red-blue-green-purple-orange clusters were formed and it was understood that the current research topics in the red cluster were higher-education and critical thinking skills and that "higher-education, critical thinking skills, experiences, university, quality, feedback" were intensively included in this cluster. The current research topics in the blue cluster include education, knowledge and instructional strategies, and in this cluster, "skills, education, knowledge, science, thinking, model, teachers, instruction, strategies, framework, curriculum, school, beliefs, children, literacy, creativity, mathematics, ability, challenges" are intensively focused. The critical thinking and language competences topics of the current research areas in the green cluster were included in this cluster as "critical thinking, validity, language, English, competence". It was determined that the current research topics in the purple cluster have performance, motivation and technology-supported learning content and that "students, performance, impact, perceptions, design, achievement, classroom, motivation, technology, engagement, self-efficacy, attitudes, inquiry, online, outcomes, experience, work, information" were intensively included in this cluster. It is seen that the current research topics in the orange cluster are out-of-scope topics and in this cluster, "dispositions" is focused intensively.

In addition, when the results of the cluster analysis on higher order thinking skills are analysed, it is understood that the topics "skills, education, students" are in an upward trend and the topics "knowledge, science, teachers" are in a downward trend.   Considering the results obtained in the research process, bibliometric analysis of the articles on higher order thinking skills in the Web of Science Core Collection (WoSCC) database can contribute more to the field by covering other higher order thinking skills other than (Metacognitive thinking skill" and "Reflective thinking skill" and "Creative thinking skill" and "Critical thinking skill") as in this study. Analysing the opinions of the relevant boards of the journal that publishes the most on the subject and the authors who publish the most and receive citations on the subject may provide a richer perspective to the field. It is seen that the journals publishing on higher order thinking skills are mostly journals publishing in the fields of critical thinking and creativity, computer and education and medicine. Considering the importance level of the subject area in journals publishing in other fields, it can be suggested to give more space.

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