Analysis of Nation Ideology Based Education and STEAM Approach in Science Education Program: A Bibliometric Analysis Using VOSviewer

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Abstract. The rapid development of knowledge and technology in the 21st century has become a support for increasing the quality and competitiveness of a nation. Integration of STEAM (Science, Technology, Engineering, Art, and Mathematics) has been widely developed in the implementation of science education programs, which should further strengthen the character and identity of a nation, not the opposite. This bibliometric analysis investigates the intersection between ideology-based education and STEAM approaches, examining the collective impact on developing critical and creative thinking skills. The results were extracted from VOSviewer and Scopus databases, and 704 documents were analyzed. We limit the search in the Scopus database to only the social sciences subject area and document types of article journals and conference papers. By exploring the intricate relationship between nation-centric pedagogies and the comprehensive STEAM framework, this study sheds light on their collective impact on learners' cognitive development. The insights derived from this analysis offer valuable perspectives for educators, policymakers, and researchers interested in the role of national ideology in shaping education and its contribution to nurturing essential thinking skills. Finally, a discussion and conclusion of the results have been carried out. This can be a turning point for future research on national ideology-based education and the STEAM approach to developing critical thinking skills.

Keywords: Nation Ideology-based Education, Science Education, STEAM Approach.

1   Introduction

Recently, there has been a growing interest within the academic community in promoting and closely connecting the humanities with sciences and technologies, recognizing it as a crucial factor for human development [1-3]. This pursuit of integration is a response to the necessity of providing new generations with a comprehensive education, especially considering the social and economic uncertainties in the foreseeable future.

It is acknowledged that the demand will not only be for scientists and technology experts but also professionals in the arts, humanities, and social sciences. This broader educational approach is deemed essential to comprehend the nuances and interpretations of human behavior [4-5].

Consequently, the conventional boundaries among transmitted knowledge from increasingly specialized academic or university disciplines are becoming blurred. This is due to new connections and interactions among subjects, resulting from their diffuse limits, creating a perceived need for a more integrative education that aligns with economic and cultural globalization. This manifests as disciplinary integration in various forms, such as transdisciplinary, interdisciplinary, multidisciplinary, cross-disciplinary, and arts integration [6-9].

An evident indication of this integration is the recent expansion of the acronym STEM to STEAM, with the addition of the A for the Arts, encompassing both visual and performing arts and, by extension, the Humanities. The motivations behind this integration are diverse, with the primary catalyst appearing to be the recognition of the importance of creativity within STEM education. Consequently, a STEAM education can be described as one that advocates for an integrated teaching approach encompassing scientific-technological, artistic, and, in general, humanistic competencies. The concept of integration, in this context, progresses from interdisciplinarity to transdisciplinary [3, 10-11].

In the 21st century, the development of science and technology has emerged as the central pillar supporting improving a nation's quality and competitiveness [12-13]. In this context, the integration of STEAM has become the focus in implementing science education programs. This integration's main aim is to strengthen a nation's character and identity, not vice versa. As an essential step towards understanding the complex dynamics between state-based ideologies and a comprehensive STEAM framework, this study uses bibliometric analysis methods. This research focuses on the intersection between ideology-based education and the STEAM approach, especially in lecture programs on basic concepts of Natural Sciences.

By exploring the relationship between state ideology-based pedagogy and a comprehensive STEAM framework, this research aims to highlight the collective impact on learners' cognitive development. This bibliometric analysis provides in-depth insight into research trends, key focuses, and conceptual developments in science education involving national ideologies and STEAM approaches [14-15]. The findings from this research have the potential to provide a valuable perspective for educators, policymakers, and researchers interested in the role of national ideology in shaping education and its contribution to developing essential thinking skills. Analysis of national ideology-based education and the STEAM approach in the natural science learning program is an in-depth study of the combination of state ideology-based education and the STEAM approach in the context of natural science learning. National ideology-based education includes values, norms, and ideologies that reflect the character and identity of a nation. Meanwhile, the STEAM approach integrates five areas of knowledge, namely science, technology, engineering, arts, and mathematics, in a holistic approach to support creative and innovative learning.

It is essential to highlight how integrating national ideology-based education and the STEAM approach in the natural science learning program can be utilized to develop science lecture programs, primarily to facilitate the good cognitive development of students [16]. This analysis uses bibliometric methods to identify research trends, main focuses, and concept developments in the context of natural science education involving national ideologies and STEAM approaches. This research aims to provide in-depth insight into how the application of national ideology in science learning can be combined with the STEAM approach to improve the quality of education and form a generation with critical and creative thinking skills. Bibliometric studies using VOSviewer can build and visualize bibliometric networks such as journals, titles, authors, publications, etc. [17-19]. Bibliometric analysis is a literature review method that uses statistical and quantitative analysis of published studies, focusing on the structure of the articles included in the references. Bibliometrics helps identify trends and patterns of scientific growth in this research context or topic. Besides that, bibliometric analysis can show the novelty and distribution of scientific references related to this research topic.

2   Methods

The Study Literature Review (SLR) framework in this research method is systematically structured, encompassing key stages and methodologies for gathering and analyzing relevant data. The initial phase involves the selection of Scopus as the primary data source, chosen for its comprehensive coverage across various scientific disciplines and recognized quality assurance through strict assessment methods. Scopus provides access to a diverse range of publications and includes valuable information on impact factors, contributing to the assessment of a journal's influence. The literature research, conducted using the Publish or Perish application, aids in systematically filtering publications based on specific keywords and title requirements, enhancing the precision of data collection. This SLR framework is further fortified by leveraging previous research insights, ensuring a well-informed application of tools and methodologies. The subsequent stages involve a meticulous process, including using VOSviewer for bibliometric analysis, Microsoft Excel for screening relevant bibliometric data, and a comprehensive analysis of selected articles. These stages collectively contribute to a robust and structured framework for conducting an effective and targeted SLR, ensuring a systematic and rigorous approach to deriving meaningful insights from scholarly publications in the chosen field of study.

The data used in this research was obtained from research published in journals and conference papers indexed in Scopus. Scopus was chosen as a data source because it covers various scientific disciplines such as social, natural, health, and humanities [20]. Scopus is considered a quality data source because it applies strict assessment methods to determine the journals' quality in its database [21]. Besides that, Scopus also provides information regarding the impact factors of the journals recorded in the database [22]. Impact factor is one of the leading indicators used to evaluate how often articles in a journal are cited by other researchers, which helps researchers assess the extent to

which a journal influences a particular field of study [23]. The existence of Scopus is widely recognized in the international scientific community.

Literature research on the selected topic has been conducted using a reference management application called Publish or Perish. Previous research conducted [24] provided detailed information regarding how to use and install this application and the steps that need to be followed to collect data. In addition, previously described the methodology for searching data from Scopus through libraries [25].

This research was carried out through a series of stages, as illustrated in Fig. 1. The following steps were involved: (1) Collecting publication data using the publish or perish application; (2) Processing analysis of bibliometric publication data using the VOSviewer application; (3) Screening of bibliometric data for articles obtained using the Microsoft Excel application and (4) Analyzing the results of selected articles.
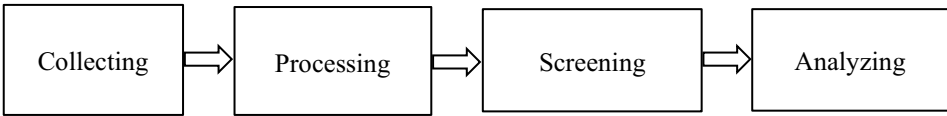
| Collecting | ⇨ | Processing | ⇨ | Screening | ⇨ | Analyzing |

Fig. 1. Bibliometric Mapping Steps

Searching for publication data using the Publish or Perish application aims to filter publications by applying the keyword "Nation ideology education STEAM approach in science education learning program" and meeting the title requirements. The selected papers were published between 2013 and 2023, and data collection was completed in September 2023. After collecting relevant articles, the results were exported in two file formats: research information systems (.ris) and comma-separated value format (*.csv). Article data obtained from the source database was mapped using VOSviewer, which produces three types of publication maps: network visualization, density visualization, and overlay visualization based on co-citation networks between the articles. A minimum keyword frequency threshold is created three times to create a bibliometric map, and less relevant keywords are removed.

The initial research stage involved leveraging the Publish or Perish application to collect publication data relevant to the study's focus systematically. This application is a powerful tool for retrieving scholarly publications, allowing researchers to filter and gather data based on specific keywords and title requirements and applying the keyword "Nation ideology education STEAM approach in science education learning program" aimed to narrow down the vast pool of publications to those directly aligned with the research objectives. This phase ensured a targeted and efficient collection process, focusing on articles published between 2013 and 2023.

Subsequently, the VOSviewer application was employed for the bibliometric analysis of the collected publication data. VOSviewer facilitates the visualization of co-citation networks, providing insights into the relationships and patterns within scholarly literature. This stage aimed to uncover critical themes, connections, and trends within the selected publications, offering a comprehensive understanding of the landscape in which the research was situated. The application of VOSviewer allowed for a nuanced exploration of bibliometric data, contributing to identifying primary research themes

and influential publications and mapping the collaborative and interdisciplinary relationships in the field.

Following the bibliometric analysis, the research transitioned to the third stage, involving screening bibliometric data for articles using Microsoft Excel. This step was crucial for refining the dataset, ensuring that only relevant articles meeting specific criteria were considered for further analysis. Microsoft Excel provided a structured platform for systematically organizing and screening the bibliometric data, contributing to the overall rigor and reliability of the research process.

The final stage encompassed the comprehensive analysis of the results derived from the selected articles. This involved a detailed examination of the refined dataset, exploring patterns, themes, and implications arising from the publications. Researchers aimed to draw meaningful insights from the selected articles, connecting the findings to the research objectives and contributing to the broader scholarly discourse. These four stages, meticulously executed, constituted a robust research process that combined technological tools and analytical methods to extract valuable insights from the wealth of scholarly publications available in the chosen field.

3   Results and Discussion

Data collection results from the Scopus database with the keyword nation ideology education, an essential representation of the state or state ideology (in the Indonesian context, Pancasila) and its implementation in education and learning, contained 704 documents. Based on the subject area, there are 22, while most articles are in the social sciences subject area, including education; in this area, there are 593 articles. The complete data presentation can be seen in Table 1.

Table 1. Document search results based on subject area.

No	Subject area	Total Documents
1	Social Sciences	593
2	Arts and Humanities	267
3	Medicine	34
4	Environmental Science	28
5	Psychology	23
6	Business, Management and Accounting	20
7	Engineering	19
8	Computer Science	18
9	Economics, Econometrics and Finance	17
10	Earth and Planetary Sciences	10
11	Multidisciplinary	8
12	Biochemistry, Genetics and Molecular Biology	8
13	Agricultural and Biological Sciences	8
14	Energy	6
15	Nursing	5
16	Health Professions	5

No	Subject area	Total Documents
17	Physics and Astronomy	3
18	Neuroscience	2
19	Mathematics	2
20	Pharmacology, Toxicology and Pharmaceutics	1
21	Immunology and Microbiology	1
22	Decision Sciences	1

In this research, the documents analyzed using VOSviewer were limited to articles, book chapters, reviews, books, conference papers, and editorials, and the total distribution can be seen in Table 2.

Table 2. Document Types Scopus Database Document Search with the Term Nation Ideology Education

No	Type Document	Total Documents
1	Article	449
2	Book chapter	136
3	Review	57
4	Book	44
5	Conference paper	18
6	Editorial	11

Network visualization shows the network between the terms being visualized. Overlay visualization shows traces of research history, while density visualization shows the density/emphasis on research groups. Fig. 2 presents network visualization or the relationship between terms visualized through a connected network. This network visualization reveals three distinct research areas on the foundations of science education for sustainable development. Fig. 2 shows a relationship between the variables studied: nation identity, education, higher education, nation building, and students. This indicates that there is a connection between the research topic variables. Development of a Basic Science Concepts Lecture Program using a Differentiated STEAM Approach that effectively equips prospective teachers to grow the profile of Pancasila students.
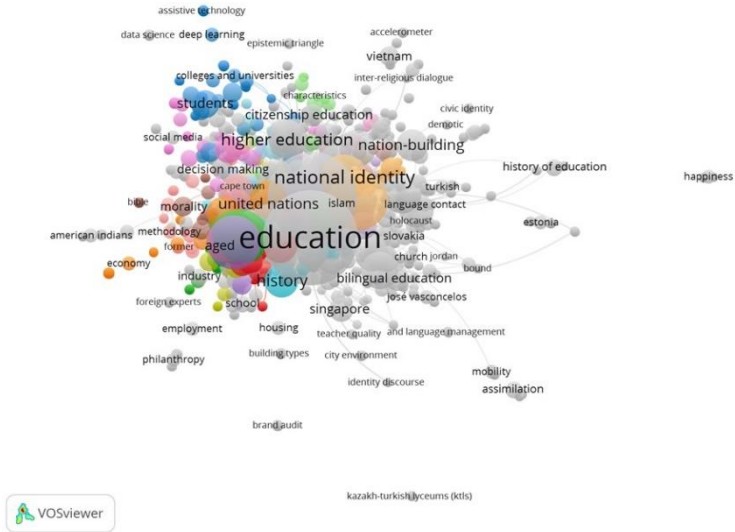
Fig. 2. Network Visualization in Terms of Nation Ideology and Education

Figure 3 presents an overlay visualization or overlapping visualization in research on the foundations of science education for sustainable development. This visualization shows the novelty of research regarding related terms. Overlay visualization shows traces of research history.
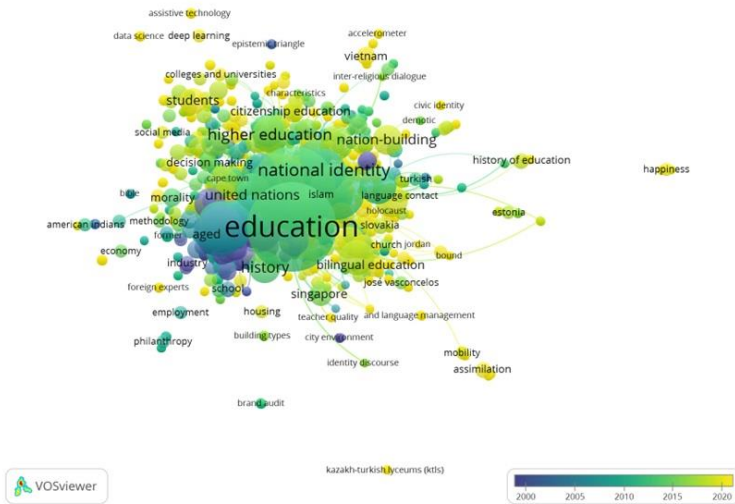

Fig. 3. Overlay Visualization of The Data Terms Nation Ideology and Education

Figure 3 shows much education research, but little is related to nation identity, higher education, and nation-building. Therefore, research on Developing a Lecture Program on Basic Science Concepts with a Differentiated STEAM Approach that equips prospective teachers to grow the profile of Pancasila students still has a high chance of novelty or newness.
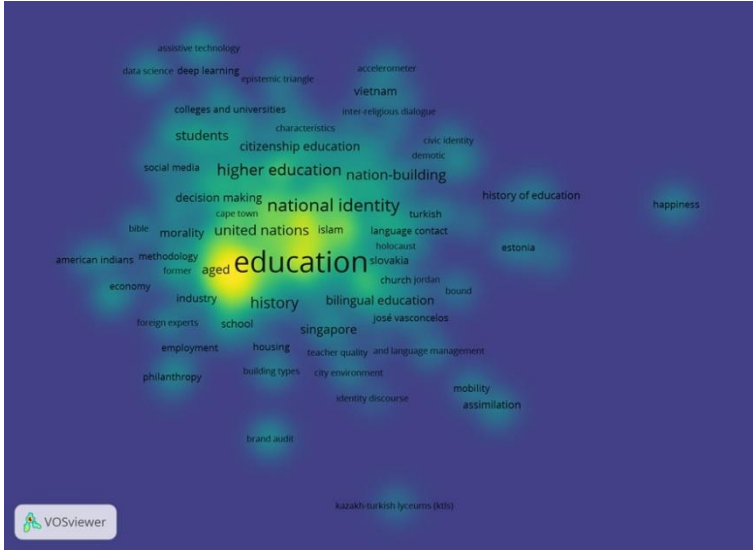
Fig. 4. Density Visualization in The Data Terms Nation Ideology and Education

Figure 4 displays density visualization. In this visualization, the brightness of the yellow color and the size of the term label circle indicate the frequency of occurrence of the term in the nation ideology education data term. In Fig. 4, the frequency of research on the term education is high. However, those related to national identity or those relevant to national ideology are still rare.

The point of limiting searches in the Scopus database is to use the keywords "nation ideology and science education." These keywords reflect the basis of the state or state ideology (in the Indonesian context, namely Pancasila) and how this ideology is implemented in science learning. As a result, there were 71 relevant documents. VOSviewer data analysis can be found in full in Fig. 5 for Network Visualization, Fig. 6 for Overlay Visualization, and Fig. 7 for Density Visualization.

Based on Fig. 5, it becomes clearer that there is a relationship between the terms ideology and science education, but judging from the number of networks, there is only one. This indicates that there is a connection between research topic variables in the context of state ideology and science learning, which is still rarely done in this field, so it is still very feasible to carry out research on the topic under study, namely the development of a basic science concepts lecture program with an effective differentiated STEAM approach to equip prospective teachers in growing the profile of Pancasila students.
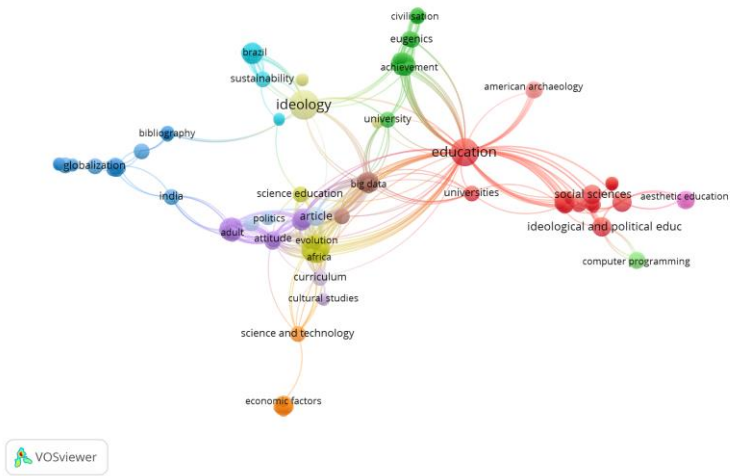
Fig. 5. Network Visualization the Data Terms of Nation Ideology and Science Education
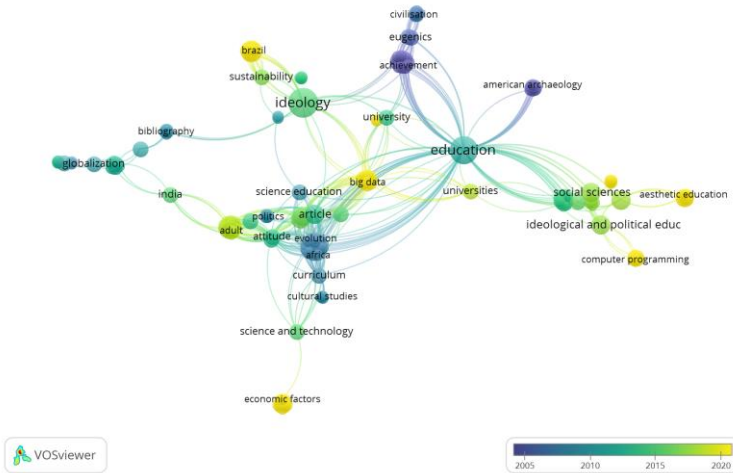

Fig. 6. Overlay Visualization on The Data Terms Nation Ideology and Science Education

Figure 6 shows that there has been much research on the term education, and seen from the color of the representation, it is close to dark green, which means it has been around for a long time, but to ideology, science education, science technology, and universities the color tends to be lighter (light green towards yellow) which means it is still new or up to date for research. Likewise, the size of the circle representation is also

smaller, meaning there is still little research on this term. Therefore, research on Developing a Lecture Program on Basic Science Concepts with a Differentiated STEAM Approach that is effective in equipping prospective teachers to grow the profile of Pancasila students is increasingly convincing that it still has high opportunities for novelty.
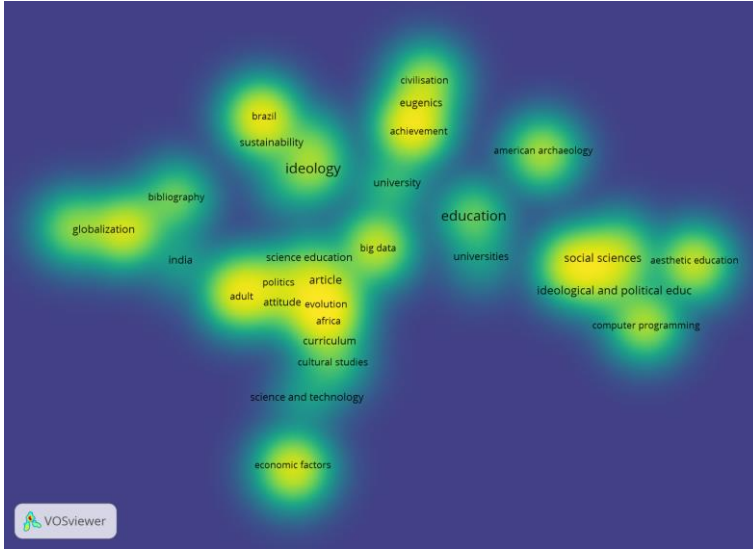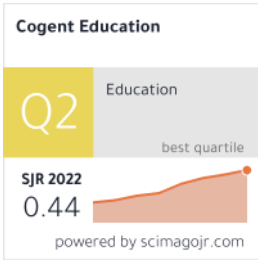

Fig. 7. Density Visualization on The Data Terms Nation Ideology and Science Education

The visualization analysis in Fig. 7 employs color brightness and term label circle size to signify the frequency of occurrence for each term, providing insights into the prevalence of research topics. The lighter and larger circles, represented in yellow, indicate a higher frequency of research on the corresponding term while fading colors closer to the background suggest less research emphasis. Notably, terms such as "science education," "ideology," "attitude evolution," "sustainability," "education," "curriculum," "science and technology," and "ideological and political education" stand out with their vibrant colors and prominent sizes, indicating that they have garnered substantial attention in academic research. These terms appear pivotal and have been the focal points of extensive research endeavors, underscoring their significance in the scholarly discourse on integrating nation ideology, science education, and STEAM approach.

Examples of analyses of four relevant journal articles studied as references for this research can be seen in Table 3.

Table 3. Example of Article Analysis That Is Relevant to The Terms Nation Ideology and Science Education

No	References	Journal Information	Analysis Results
1	Mlinar, K., & Krammer, G. (2021). Multicultural attitudes of prospective teachers: The influence of multicultural ideology and national pride. International Journal of Intercultural Relations, 84, 107-118 [26].	International Journal of Intercultural Relations — Q1 — Business and International Management — best quartile — SJR 2022 0.82 — powered by scimagojr.com	Higher multicultural ideology and lower national pride influenced teacher candidates' multicultural attitudes. However, no similar relationship was found with intergroup contact, highlighting the importance of strengthening multicultural ideology in initial education programs for teacher candidates.
2	Erhart, R. (2016). A cross-national examination of prejudice toward immigrants: the role of education and political ideology, Journal of Aggression, Conflict and Peace Research, 8 (4), 279 – 289 [27].	Journal of Aggression, Conflict and Peace Research — Q2 — Law — best quartile — SJR 2022 0.25 — powered by scimagojr.com	This study investigates the relationship between educational level, political orientation, national identity, and prejudicial attitudes toward immigrants cross-nationally, finding that increasing educational levels are associated with decreased prejudice. In contrast, political conservatism and national identity are associated with increased prejudice. These findings support previous literature

No	References	Journal Information	Analysis Results
			and highlight the importance of national identity factors in increasing resistance to anti-immigrant prejudice across democratic contexts.
3	Wang, D. (2016) Learning or becoming: Ideology and national identity in textbooks for international learners of Chinese, Cogent Education, 3:1, 1140361, DOI: 10.1080/2331186X.2016.1140361 [28]	**Cogent Education** Q2 Education best quartile SJR 2022 0.44 powered by scimagojr.com	Textbooks in Mandarin as a foreign language education in Mainland China have an ideological nature that reflects China's dominant culture and values, especially in the context of national identity. This study uses corpus-based and content analysis to show that the textbooks highlight aspects of Chinese national identity, with the frequency of use of the word "nation" far exceeding that of other countries. In addition, it was revealed that the main learning content in the textbooks is related to Chinese moral and civic education, which may be less attractive to international language

No	References	Journal Information	Analysis Results
			learners. This study recommends open discourse and the development of intercultural understanding in the curriculum to increase the participation and interest of international learners.
4	Ince, A. (2019). Teachers' Perception of the National Ideology of Kemalism and Its Effects on Kurdish Pupils. Universal Journal of Educational Research, 7(1), 211-222 [29].	Universal Journal of Educational Research Not yet assigned quartile SJR 2022 0 powered by scimagojr.com	This study, based on interviews with Turkish and Kurdish teachers, shows that the national ideology of Kemalism has a serious negative impact on Kurdish students, sidelining their identity and triggering social problems such as exclusion and polarization in society. Negative perceptions of the Atatürk cult and overemphasis on Kemalist ideology in the Turkish education system also created disapproval among teachers, including those with nationalist tendencies. The impact on Kurdish students may affect their well-being

No	References	Journal Information	Analysis Results
			and the degradation of Kurdish identity compared to the promotion of Turkishness in the curriculum.

This study reflects the urgency of understanding the relationship between national ideology and STEAM approaches in science education and creates a solid foundation for developing more effective teaching methods. Finally, the results of this analysis are presented in the discussion and summarized in conclusions, which can be a turning point for future research in the field of education based on national ideology and the STEAM approach in lecture programs on basic natural science concepts.

4   Conclusion

The bibliometric analysis reveals several interesting findings. The insights derived from this analysis offer valuable perspectives for educators, policymakers, and researchers interested in the role of national ideology in shaping education and its contribution to nurturing essential thinking skills. Finally, a discussion and conclusion of the results have been carried out. This can be a turning point for future research on national ideology-based education and the STEAM approach to developing critical thinking skills. This perspective has the potential to provide valuable guidance for educators, policymakers, and researchers interested in the role of national ideology in shaping education and its contribution to developing essential thinking skills in the modern era of science and technology. The conclusions from this analysis can be a basis for more in-depth future research and practical application in science education based on national ideology and the STEAM approach.

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