Jurnal Mimbar Ilmu
Volume 29, Number 1, 2024, pp. 32-45
P-ISSN: 1829-877X E-ISSN: 2685-9033
Open Access: https://doi.org/10.23887/mi.v29i1.70400

Trends in Climate Change Education Studies in the Last Ten Years: A Systematic Literature Review

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ARTICLE INFO

Article history:
Received November 20, 2023
Accepted March 20, 2024
Available online April 25, 2024

Kata Kunci:
Aksi Nyata, Integrasi Kurikulum, Pelatihan Pendidik, Pendekatan Interdisipliner, Pendidikan Perubahan Iklim

Keywords:
Real Action, Curriculum Integration, Educator Training, Interdisciplinary Approach, Climate Change Education,

ABSTRAK

Perubahan iklim menjadi perhatian semua negara di dunia. UNESCO turut serta dalam upaya meningkatkan kesadaran mengenai perubahan iklim, salah satunya dengan membuat program Greening Education Partnership. Climate Change Education (CCE) merupakan upaya di bidang pendidikan untuk meningkatkan kesadaran siswa terhadap perubahan iklim. Artikel ini mencoba menganalisis tren publikasi mengenai CCE dan menjajaki peluang lain untuk penelitian lebih lanjut mengenai topik CCE. Metode yang digunakan adalah metode sistematik literatur review (SLR) dan analisis data menggunakan bibliometrik. Data yang digunakan dalam penelitian ini adalah dokumen yang diterbitkan oleh jurnal-jurnal pada database Scopus yang diterbitkan pada tahun 2013-2022. Pada tahun 2013-2022, terdapat 462 dokumen yang dapat dicari di database Scopus dengan kata kunci 'pendidikan perubahan iklim'. Hasil analisis menunjukkan bahwa pembahasan tentang CCE terkait kurikulum, pembelajaran, dan kesiswaan telah banyak dipelajari dan dipublikasikan. Namun, tidak ada interaksi akademis yang terlihat antara penulis. Kondisi tersebut dapat menjadi landasan bahwa CCE perlu dilaksanakan secara bijaksana untuk meningkatkan kesadaran terhadap perubahan lingkungan. Selain itu, implementasinya juga memerlukan peran kolaboratif dari masing-masing sektor agar implementasi CCE dapat terlaksana secara maksimal. Perlu ada kebijakan untuk mendorong implementasi dengan mengintegrasikan CCE dan kurikulum. Sekolah dan universitas mendorong guru dan dosen untuk menyampaikan CCE dalam pembelajaran dengan memasukkan topik-topik spesifik yang dapat dikaitkan.

ABSTRACT

Climate change is a concern for all countries in the world. UNESCO is taking part in efforts to increase awareness regarding climate change, one of which is by creating the Greening Education Partnership program. Climate Change Education (CCE) is an effort in the education sector to increase students' awareness of climate change. This article attempts to analyze publication trends regarding CCE and explore other opportunities for further research on the topic of CCE. The method used is the systematic literature review (SLR) method and data analysis using bibliometrics. The data used in this research are documents published by journals on the Scopus database published in 2013-2022. In 2013-2022, 462 documents can be searched in the Scopus database with the keyword 'climate change education'. The analysis results show that discussions about CCE related to curriculum, learning, and students have been widely studied and published. However, there is no visible academic interaction between the authors. These conditions can be the basis that CCE needs to be implemented thoughtfully to increase awareness of environmental change. Apart from that, its implementation also requires collaborative roles from each sector so that CCE implementation can be carried out optimally. There needs to be a policy to encourage implementation by integrating CCE and the curriculum. Schools and universities encourage teachers and lecturers to deliver CCE in learning by including specific topics that can be related.

1. INTRODUCTION

Climate change is a global issue that must concern all countries. This is because the impact and risks are significant for the survival of future generations. Climate change is a complex problem and is related to

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other sectors. Climate change intersects a person's knowledge, values, and experience, especially concerning awareness about climate change. It always requires real action to resolve it, even though the information is incomplete due to knowledge gaps (Stoeth & Carter, 2022; York et al., 2021). This knowledge gap means that education regarding climate change must be obtained through formal and non-formal education. The main principle of climate change education is to provide an understanding of climate change, adaptation, and mitigation (Arwan et al., 2021; Monroe et al., 2019). These three main principles must be supported by activities in the form of learning, reflection, and connection between students and learning resources regarding climate change.

Since the 'Climate Paris Agreement', education related to climate change has become one of the sectors widely studied to increase awareness of climate change for students (Borde et al., 2022; Reid, 2019). Climate Change Education (CCE) can be implemented by mobilizing climate change literacy by conveying climate change issues in the national education curriculum (Arwan et al., 2021; Feldbacher et al., 2023). Educators can teach about the importance of protecting the environment, understanding disaster risks, and taking appropriate mitigation steps, including thinking skills, motivation, future orientation, identity, and worldview, as well as emotions, including hope to be the primary driver of environmental concern (Feldbacher et al., 2023; Jones & Podpadec, 2023; Trott et al., 2020). One of UNESCO's programs is the 'Greening Education Partnership', an open and inclusive Climate Education Program that invites various countries to equip students with knowledge, skills, values, and attitudes to overcome climate change.

Introducing and studying climate change is an essential program to be implemented as early as possible for the younger generation, which is multidisciplinary, transformative, and has a more holistic approach to climate change education (Bentz, 2020; Leal-Filho et al., 2021; Sakari Tolppanen et al., 2022). A strategy is needed in implementing this program so that the role of education is the foundation for teaching climate change education, mitigation, and adaptation. Teaching and learning about climate change must also relate to the way of life of the people of the country. Climate change literacy can be carried out to increase understanding and awareness of environmental issues and support sustainable development practices by providing awareness and ability to all parties to increase self-awareness to protect the environment (Kolenatý et al., 2022; Rahmah, 2022; Rousell & Cutter-Mackenzie-Knowles, 2020). This has a positive impact in the long term, both in preserving the environment and in producing a generation that is more caring and responsible for the earth.

Curriculum integration toward sustainable development is a global challenge in the 21st century because education will produce outputs and outcomes ready to address all global needs (Agbedahin, 2019; Franco et al., 2019). So, the idea of a curriculum based on sustainable development education must link learning objectives to the surrounding life. The impact of climate change is not only on the natural environment sector, but every sector is experiencing many challenges and threatening the stability of life. The big challenge facing CCE is bridging the attitude and behavior gap. Although students can develop positive attitudes toward climate change, these attitudes may not turn into behavior without intervention (Hornsey & Fielding, 2020; Tang, 2022). This aims to bring climate change and its urgency to students' attention to climate change.

This article a how the curriculum supports the implementation of CCE and describes how it is implemented in universities and schools. Apart from that, this article also attempts to analyze the role of teachers in the CCE learning process so that it can produce students who have the awareness to maintain a future-oriented environment. This research brings a perspective to the field of Climate Change Education (CCE) by conducting a comprehensive analysis of publication trends over the last decade. The novelty of this study mere examination of academic literature and delves into the practical aspects of CCE, emphasizing a multidisciplinary, transformative, and holistic approach. The study not only explores how curricula support CCE but also investigates the crucial role of teachers in shaping students' awareness and behavior towards climate change. It recognizes the challenge of bridging the gap between positive attitudes and actual behavioral change and highlights interventions needed to translate attitudes into concrete actions.

2. METHOD

This research uses the Systematic Literature Review (SLR) method. The SLR method is used to identify other relevant research, examine future research opportunities (Gough et al., 2017), and help see other viewpoints on a research topic to provide input for further research (Linnenluecke et al., 2020). In this research, researchers attempt to examine various possibilities and efforts that can be made to overcome climate problems using an educational approach so that the documents reviewed are documents obtained by searching using the keyword "climate change education" in the Scopus database for the period 2013-2022.

There are several stages in carrying out the SLR method. Adapted from previous study there are three main stages, namely, planning the review, conducting the review, and reporting the review (Xiao & Watson, 2019). The stages carried out in this research can be seen in more detail in Table 1.

Table 1. Stages Research

SLR Stages		Inforamtion
Planning the Review	Step 1: Formulating the problem	Determining the problem formulation. The research determined that the research question was, "What are the trends in research on CCE in the last ten years?"
	Step 2: Develop and validate the review protocol	Determining the sources to be analyzed. In this research, various publications (documents) published and indexed by Scopus in the last ten years (2013-2022) were searched with the following search technique. Title-Abs-Key ("Climate Change Education") And (Limit-To (Pubyear , 2013) Or Limit-To (Pubyear , 2014) Or Limit-To (Pubyear , 2015) Or Limit-To (Pubyear , 2016) Or Limit-To (Pubyear , 2017) Or Limit-To (Pubyear , 2018) Or Limit-To (Pubyear , 2019) Or Limit-To (Pubyear , 2020) Or Limit-To (Pubyear , 2021) Or Limit-To (Pubyear , 2022))
Conducting the Review	Step 3: Search the literature	Searching using keywords in stage 3, then produced 462 documents. This document is relevant to the study; it contains CCE in the title, abstract, and keywords.
	Step 4: Screen for inclusion	Researchers reviewed abstracts to select documents included in the discussion scope regarding CCE.
	Step 5: Asses quality	To ensure that articles included in the CCE scope in the abstract, in full text, discuss CCE from the perspective of the studies studied in this research.
	Step 6: Extract data	Extract database obtained from search results in Scopus (in stage 4) is then processed using the VOSviewer program.
	Step 7: Analyze and synthesize data	Analyze and synthesize graphic results produced by VOSviewer based on the Scopus database.
Reporting the Review	Step 8: Report findings	Create research reports in article form.

The data processing technique used in this research is a bibliometric analysis focusing on science mapping, which describes intellectual interactions and structural connections between the research being analyzed (Donthu et al., 2021). In this research, the bibliometric analysis technique used is co-occurrence analysis.

3. RESULT AND DISCUSSION

Result

The results of this research were obtained from the results of data processing carried out by researchers. This research describes research trends on CCE in the last ten years in the Scopus database. The search was done using the following technique and produced 462 document results. Number of CCE documents each year is show in Table 2.

Table 2. Number of CCE Documents Each Year

Year	Documents
2022	110
2021	85
2020	56
2019	56
2018	38
2017	42
2016	19

Year	Documents
2015	16
2014	22
2013	18
Total	**462**

The number of documents published in the 2013-2022 period on the Scopus database with the keyword "climate change education" can be seen in Table 2. The analysis results show that in the 2013-2022 period, there were 462 documents discussing climate change education (CCE) and open access. The increase in the number of documents published on the Scopus database in 2013-2022, with the keyword "climate change education". In general, documents published regarding CCE that are open access on the Scopus database continue to increase until 2013-2022. Document by type is show in Table 3.

Table 3. Document by Type

Document Type	Documents
Article	323
Book Chapter	90
Review	13
Book	10
Conference Paper	9
Note	7
Editorial	4
Conference Review	2
Letter	2
Erratum	1

Table 3 describes several types of documents published in journals on the Scopus database for 2013-2022, which were searched using the keyword "climate change education," with ten documents obtained. The results of co-occurrence analysis based on author keywords, depicted in Figure 1

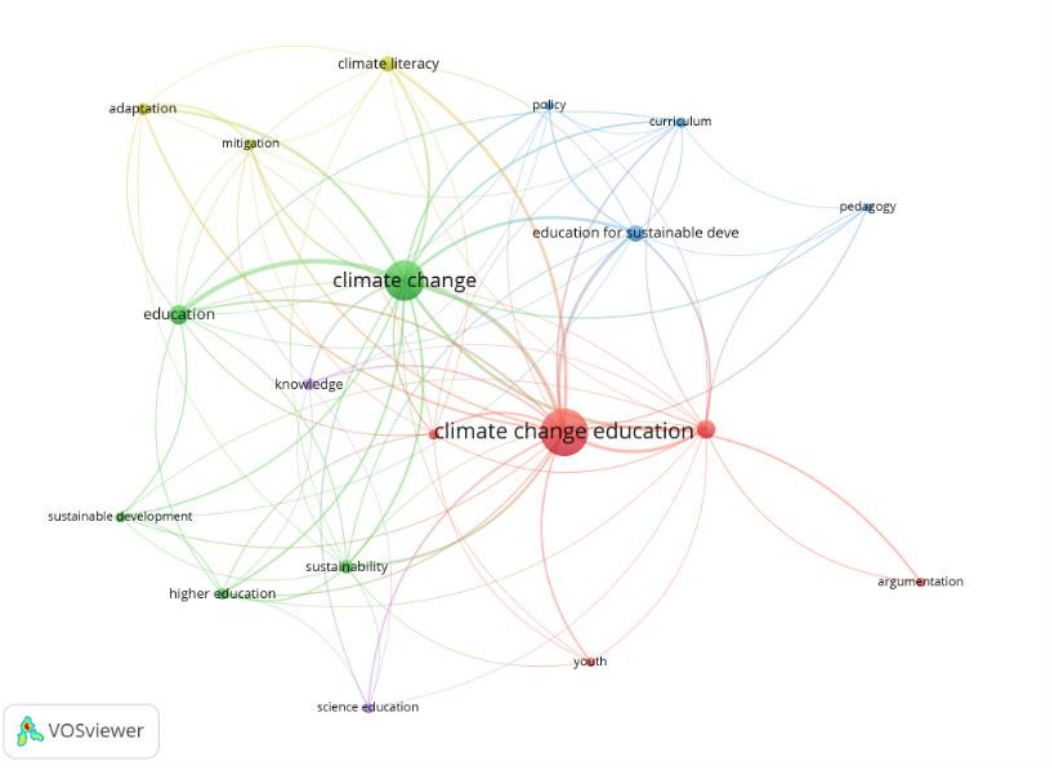

Figure 1. Co-Occurrence Based on Author Keyword (>=7 Same Keyword)

Figure 1 provide an overview of the most dominant keywords in the CCE context. The analysis results reflect the close relationship between the keywords 'climate change education' and 'climate change', illustrating that CCE is often combined with understanding climate change as a research subject. This reflects the complexity of the relationship between education about climate change and the issue of climate change itself in scientific research. The results of the co-occurrence analysis with all keywords can be seen in Figure 2.

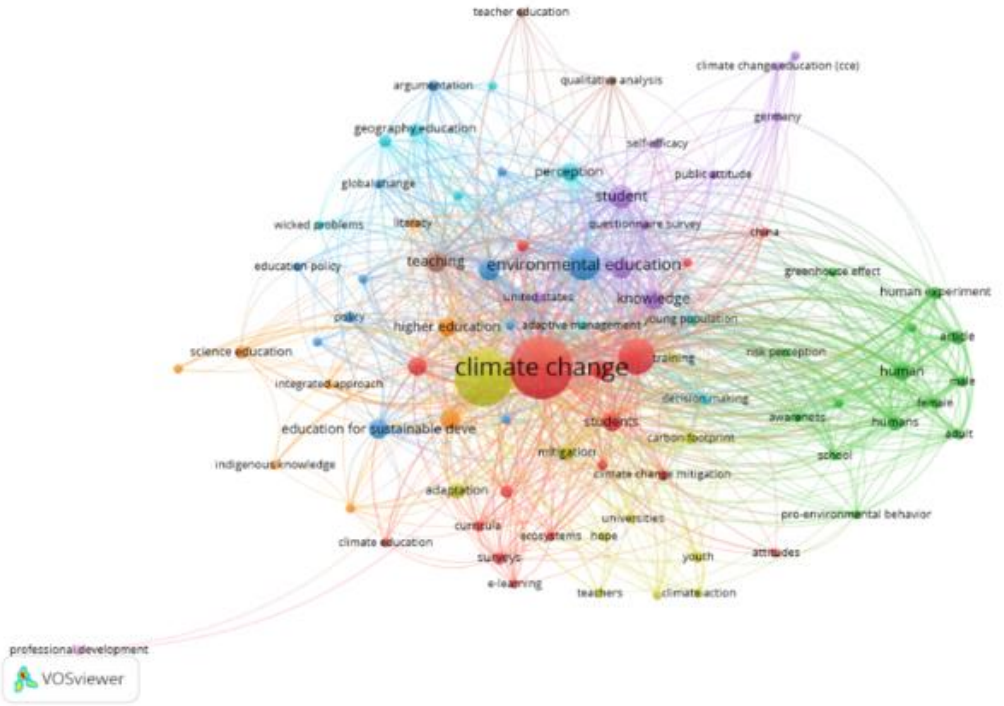

Figure 2. Co-Occurrence, All Keyword Analysis

Figure 2 show this study analysis results illustrate that the keyword 'climate change' is the largest cluster among all existing clusters and shows that this word is most widely used. This follows data from the Scopus database using the keyword "climate change education" in 2013-2022, so the analysis results are closely related to climate change. Figure 3 shows the results of co-occurrence analysis in journals in the Scopus database using the search keyword 'climate change education' with the keyword 'curricula' in the document

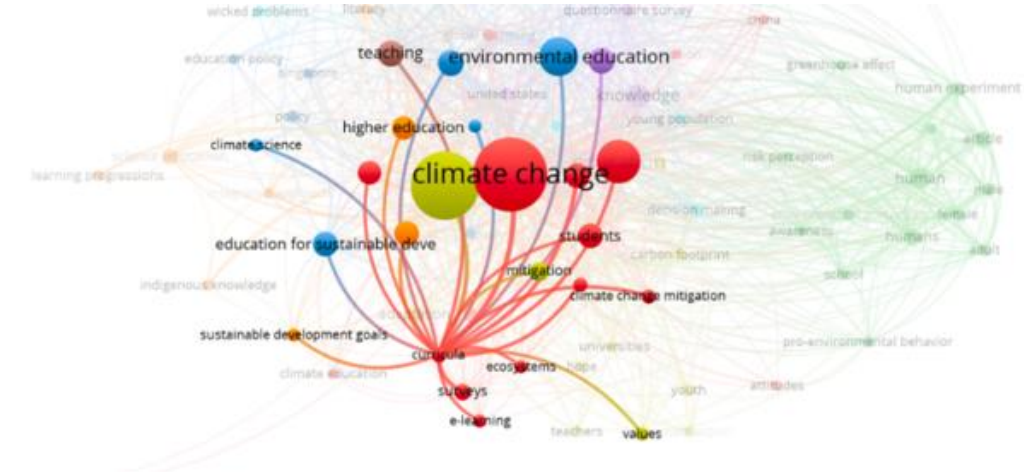

Figure 3. Co-Occurrence, Keyword CCE with Curricula

Figure 3 generally illustrates that in the 2013-2022 period, documents regarding CCE examine environmental awareness from a curriculum and education perspective on the Scopus database. Apart from

that, the results of this analysis also provide an opportunity to research CCE with the curriculum further so that awareness of climate change becomes a topic that is generally known to everyone through the implementation of the curriculum in formal and non-formal education. The results of co-occurrence analysis using the keyword 'teaching' can be seen in Figure 4.

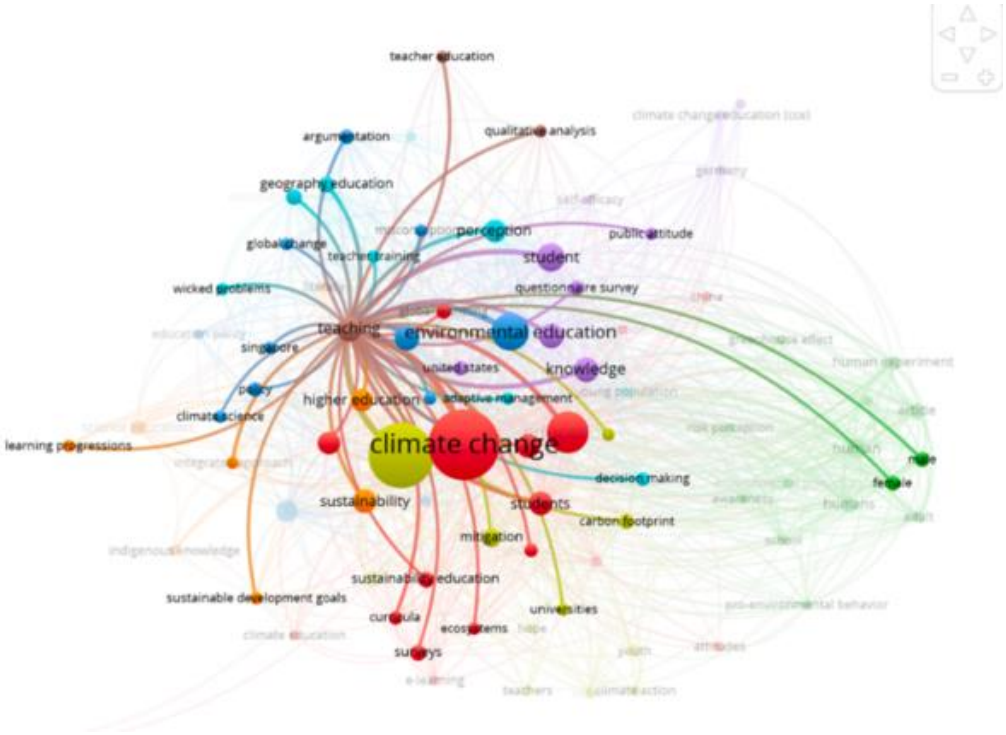

Figure 4. Co-Occurrence, Keyword CCE with Teaching

Base on Figure 4, the results of data analysis obtained from journals on the Scopus database using the keyword "climate change education" show that in the 2013-2022 period, there were documents regarding CCE related to teaching activities. The opportunity to link teaching activities with climate change is possible. Teaching activities related to the teacher's role also require teachers to understand climate change, so creating training for teachers related to CCE is possible. The results of the co-occurrence analysis of documents obtained from the Scopus database using the search keyword 'climate change education' with the keyword 'student' in documents in the 2013-2022 period is show in Figure 5.

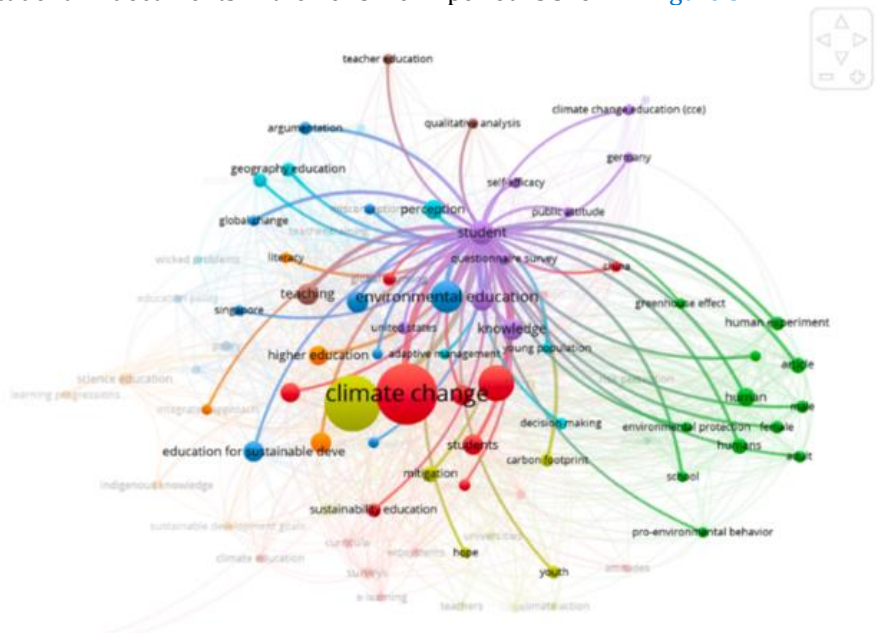

Figure 5. Co-Occurrence, Keyword CCE with Student

In Figure 5, you can see the results of the co-occurrence analysis of documents obtained from the Scopus database using the search keyword 'climate change education' with the keyword 'student' in documents in the 2013-2022 period. This also illustrates that students are related to this CCE topic because students as subjects also learn a lot and are involved with this topic. From the results of the data analysis above, strengthening students' perceptions so that they care about the surrounding environment is possible.

Discussion

The results of data analysis obtained based on the Scopus database show that in 2013-2022, 462 documents discussed CCE and were open access based on Table 2. The types of documents in the database also vary, such as articles, chapter books, reviews, and so on, based on Table 3. Using bibliometrics, a relationship was found between the topics discussed in this article using the SLR method. Some of the issues referred to are related to research questions, namely related to how the curriculum supports CCE, how universities and schools support the implementation of the curriculum, what is the role of teachers in implementing CCE learning, and expectations of how students will protect the environment with a future orientation. The results of this research, based on Scopus database analysis spanning from 2013 to 2022, reveal that 462 open-access documents discussed Climate Change Education (CCE). The document types varied, including articles, chapter books, and reviews. The research utilized bibliometrics to establish relationships between topics, addressing research questions related to curriculum support, the role of universities and schools, and educator training in CCE. The novelty of this research lies in its detailed analysis of CCE trends, emphasizing interdisciplinary approaches, curriculum integration, and the roles of educators, universities, and schools. Differing from previous research endeavors, this study delves deeper by specifically honing in on open-access documents, thus facilitating a more readily accessible and inclusive understanding of Climate Change Education (CCE). It transcends the exploration of particular facets of CCE and, conversely, takes a holistic approach by addressing curriculum integration, interdisciplinary approaches, and the roles of educational institutions. Such an approach widens the understanding of CCE and underscores the crucial role of educators in fostering a comprehensive understanding of climate change among students.

Integration in the Curriculum

Based on the co-occurrence data of the keyword CCE with 'curricula' in Figure 3, several clusters describe CCE topics integrated into the curriculum. Integrating climate change education topics into the curriculum can be done through an internalization process in several subjects, for example, economics, social, science, geography, and so on (Chang & Pascua, 2017; Molthan-Hill et al., 2019; Monroe et al., 2019), to be able to improve environmental quality, focus on learning, critical and creative thinking (Rahmah, 2022; Stevenson et al., 2017). Thus, integrating climate change education into the school curriculum can help prepare students to face a rapidly changing future. According to previous study CCE must be firmly integrated into their curricula to ensure that students understand climate change and are ready to take the necessary actions to maintain the sustainability of life on the Earth (Tibola-da-Rocha et al., 2020).

Integration in the curriculum, especially in the CCE context, provides benefits in improving the quality of education. Integration in the curriculum allows for the development of more profound insights into climate change (Abbott & Wilson, 2014; Aikens et al., 2021). By integrating material from various subjects, students can understand the relationship between climate change and multiple aspects of life, such as the economy, environment, and society (Chang, 2017; Kolleck & Schuster, 2022) to increase their understanding of the impacts and solutions towards climate change, as well as seeing the relevance of climate change issues in their daily lives (Duram, 2021; Law et al., 2021; Lovett et al., 2018) by including elements from various scientific disciplines, and learning becomes more varied and interesting. Integrated CCE also helps students develop analytical and critical skills that are urgently needed to understand and face the challenges of climate change (Blum et al., 2013; Wi, 2019). Curriculum integration in the CCE context also prepares students to face real-world challenges climate change poses. By getting used to connecting and integrating knowledge from various fields, students become better prepared to face these problems and provide more effective solutions (Aikens et al., 2021; Greer, 2021).

Integration in the curriculum can also improve understanding of abstract concepts related to climate change. When students see how these concepts apply in different contexts, they can internalize their experience in a deeper and more meaningful way. Integration provides opportunities for using knowledge, changing relevant information and knowledge in students' daily lives, and bridging the gap between theory and practice in overcoming climate change (Casanova et al., 2018; Olsson, 2022). CCE integration can help students build a deeper understanding of climate change, increase learning motivation, prepare them for

the real challenges faced by climate change, and transform abstract concepts into more applied knowledge in facing the pressing issue of climate change (Aikens & McKenzie, 2018; Buckland et al., 2018). By developing a well-integrated curriculum, education can become a more meaningful and effective experience for students in efforts to overcome climate change.

Interdisciplinary Approach

The interdisciplinary approach in CCE is a highly relevant educational strategy in addressing the increasingly pressing problem of climate change by combining elements from various scientific disciplines to create a more comprehensive understanding of climate change and more effective solutions, as well as facilitating collaboration between specialists from multiple fields (Gibbs et al., 2022; McCright et al., 2013). This can also be seen in Figure 1, which explains the co-occurrence based on the Author Keyword; Figure 2, which describes the co-occurrence with all keyword analysis; and Figure 4, which illustrates the relationship between the co-occurrence keyword CCE and teaching. Teachers can apply climate change learning in various subjects and aspects of life, especially now that the national curriculum is paying attention to climate change issues (Fortner, 2001; Sudrajat & Kumalasari, 2023).

One of the main benefits of an interdisciplinary approach in CCE is that it promotes a deeper and more integrated understanding of climate change from a variety of disciplinary backgrounds, identifying patterns and linkages that might be missed in a single disciplinary approach as well as exploring unexplored areas to address climate change for students (Alves & Azeiteiro, 2018; Borde et al., 2022; Körfgen et al., 2017). The resulting solutions can be more comprehensive and sustainable by involving various fields in teaching and solving climate change problems (Law et al., 2021; Siegner, 2018). In implementing CCE, teachers take an interdisciplinary approach by integrating CCE with school subjects. Overall, the interdisciplinary approach in CCE is an approach teachers can use in the learning process to increase understanding, innovation, and solutions to complex and urgent climate change problems.

The Role of Universities and Schools

Look at the potential role universities and schools can play based on CCE articles relating to 'curriculum' and 'teaching' in Figure 3 and Figure 4. Universities and schools play different roles but are interrelated in the CCE context. As higher-level educational institutions and research centers, universities are providers of in-depth knowledge and innovation, critical in understanding and overcoming complex challenges, such as climate change (Booth et al., 2020; Daskolia, 2022; Hindley, 2022). Universities have a responsibility to prepare students and society to contribute actively in facing global problems, one of which is mitigation and adaptation to climate and environmental change (Hess & Collins, 2018; Leal-Filho et al., 2021). Learning about climate change can be the basis for the younger generation to recognize the global challenge and find ways to adapt to climate change (Ayanlade & Jegede, 2016). In the context of CCE, universities can provide higher education related to climate change, conduct in-depth research to understand its impacts and develop innovative solutions to address environmental problems (Erlandsson et al., 2022; Jeong et al., 2021). Universities also have a responsibility to form future leaders who care about the issue of climate change and are ready to become agents of positive change in facing this problem.

Schools provide a foundation of education for the young generation, helping them develop social skills and character essential to building an inclusive and sustainable society (Nam & Lee, 2021; Yli-Panula et al., 2022). On the other hand, schools have an essential role in incorporating CCE into their curricula, ensuring that learners understand and are aware of the impacts of climate change and encouraging them to take sustainable actions in daily life in a positive way (Ennes et al., 2021; Liston & Devitt, 2020; Opuni-Frimpong et al., 2022). Awareness and education about climate change must become an integral part of the educational process, creating a generation that is ready and cares about maintaining the sustainability of our planet (Asimakopoulou et al., 2021; Ballegeer et al., 2019; Ojala, 2021). By working together and carrying out their roles well, universities and schools can significantly contribute to building a more insightful and sustainable society.

Educator Training

Educational training is related to Figure 4, which explains the co-occurrence analysis results of the CCE keyword with teaching. The role of educators in society has a significant influence in shaping future generations and helping students develop their potential, including learning about climate change issues (Howard-Jones et al., 2021; McNeal et al., 2017; Puttick & Talks, 2022). In an educational context, the role of an educator involves more than simply imparting knowledge; they also shape students' character and values and help them face the challenges of an ever-changing world (Nikendei et al., 2020; Scarfe, 2022). CCE is a critical aspect that must be emphasized in the role of educators by creating an environment that stimulates students' interest and desire to understand the impacts of climate change and mitigation efforts

through knowledge about climate change so that teachers can understand the issue (Asshoff et al., 2021; Demant-Poort & Berger, 2021; S Tolppanen & Kärkkäinen, 2021). Educators also have a role in encouraging creativity and critical thinking in climate change by encouraging students to create new ideas to support environmental protection efforts (Chang, 2017; Li et al., 2021)

Educators also act as mentors who help students develop a deeper understanding of climate change and the steps that can be taken. They also identify and support students' development according to their respective levels of understanding of climate change issues, including understanding of ethics and values. -values, and sustainable behavior (Ceyhan & Mugaloglu, 2020; Rushton, 2019)

Previous study stated that improving teacher quality is needed to overcome several challenges (Okoli, 2014). Therefore, to support teachers in implementing more optimal climate change learning, one way that can be done is by providing training to teachers. Through training activities, teachers are equipped to handle the climate change curriculum effectively through teaching activities, providing sustainable education, disseminating knowledge and research findings using fact-based and normative methods, workshops, and group discussions, as well as developing and increasing the potential of teachers (Eklund, 2018; Plutzer et al., 2016). In the modern era, previous study argues that educators must prioritize CCE to create an environmentally aware generation competent in climate change issues and ready to take concrete action to overcome complex environmental challenges (Nicholls, 2017).

Real Action

Real action collaboration in CCE is a concrete step to increase understanding of climate change and encourage sustainable action. In CCE, concrete actions include various components that ensure students understand climate change issues. This can be seen in Figure 6, which illustrates the co-occurrence of the keyword CCE with students. One critical step is developing an integrated curriculum incorporating climate change into various subjects so that students can see the relationship between climate change and the topics they study daily (Lock, 2019; Markowitz et al., 2018). Well-trained teachers can provide a deeper understanding to their students, inspiring them to take sustainable action (Andrea & Petkou, 2022; Everth, 2022). Increasing access to relevant and easily accessible learning resources also supports student learning, which helps students explore climate change issues in exciting and meaningful ways, including the use of technology (Lee et al., 2013; Pfirman et al., 2021; Smith et al., 2019). Environmental awareness programs in schools, such as greening or waste reduction activities, help students understand the practical impacts of climate change. Students not only gain knowledge but are also directly involved in sustainable action.

Real action in CCE creates a deep understanding of climate change and encourages the younger generation to play an active role in maintaining environmental sustainability. With these concrete steps, climate change education becomes a force that inspires and empowers individuals to take action to fight climate change, protect our planet, and create a more sustainable future.

Hope for the Future

The hope for the future in CCE is to create global awareness about the issue of climate change and encourage concrete actions that are possible for students to take. Through Figure 6, which illustrates the co-occurrence of the keyword CCE with students, related articles explain students' roles in the future. Future generations are expected to be agents of change in maintaining environmental sustainability at local and global levels by bringing innovation and new solutions to overcoming climate change and becoming environmental leaders in various fields (Ojala, 2015; Winter et al., 2022). According to previous study profound real hopes about climate change will encourage more decisive policy changes to protect the environment (Ferguson, 2022).

Learners worldwide become environmental ambassadors who actively promote awareness about climate change and support concrete action in their communities. Learners become agents of change in environmental protection campaigns, encouraging the private sector and government to adopt sustainable practices, inspiring positive changes in individual behavior, helping shape policies, campaigning for sustainable practices, and encouraging investment in renewable energy (Baldwin et al., 2022; Trott et al., 2020; Verlie, 2019). Learners worldwide become environmental ambassadors who actively promote awareness about climate change and support concrete action in their communities. Learners become agents of change in environmental protection campaigns, encouraging the private sector and government to adopt sustainable practices, inspiring positive changes in individual behavior, helping shape policies, campaigning for sustainable practices, and encouraging investment in renewable energy.

The implications and contributions of this research to the scientific field are detailed analysis of CCE trends provides a comprehensive overview, guiding researchers, educators, and policymakers in comprehending the evolving landscape of climate change education. The emphasis on curriculum integration and the interdisciplinary approach offers practical insights for educators, thus enhancing the

effectiveness of CCE. Additionally, the delineation of the roles of universities and schools underscores their responsibilities and potential contributions to addressing climate change. However, this research does have its limitations. The reliance on the Scopus database might omit pertinent non-indexed publications, potentially constraining the dataset's comprehensiveness. Moreover, the study's temporal scope (2013-2022) might not capture recent developments in CCE. To mitigate these limitations, future research could encompass a broader range of databases and extend the time frame for a more up-to-date analysis. Suggestions for future research include delving into regional variations in CCE implementation, conducting in-depth case studies on successful CCE programs, and assessing the long-term impact of integrated curricula on students' environmental attitudes and behaviors. Furthermore, investigations into the effectiveness of specific teaching methodologies and educational technologies in CCE could enhance the practical applicability of these findings.

4. CONCLUSION

Studies conducted using the SLR method describe various opportunities that can be implemented. Strong policies from the government can encourage the implementation of CCE in society, especially in schools and educational institutions. The government can encourage the integration of CCE with the curriculum to provide awareness of climate change among students in formal and non-formal education. As educational implementing institutions, universities, and schools must support CCE policies. This is done to ensure that students and students are aware of the environment around them through the educational process they go through. Lecturers and teachers can implement CCE in learning. Some forms of implementation that have a great opportunity to be carried out are by including topics regarding environmental awareness and climate change in environmental subjects or including environmental topics in other subjects. The implementation process was carried out to increase the awareness of students and students as part of the implementation of CCE regarding the importance of environmental conservation by protecting the environment, which can start with oneself and the family environment.

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