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# Mapping Research on Environmental Awareness: A Systematic Literature Review (2000–2025)

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**ABSTRACT**

Environmental awareness has emerged as a strategic response to the triple planetary crisis of climate change, pollution, and biodiversity loss. Despite the rapid growth of related research, studies remain fragmented across disciplines, creating inconsistencies in concepts and measurement. This study aims to map research trends, effective teaching approaches, and key variables associated with environmental awareness in education through a bibliometric-based systematic literature review of Scopus-indexed publications from 2000–2025. Using PRISMA procedures and VOSviewer analysis, 43 selected articles were examined to identify publication patterns, keyword networks, and dominant research themes. The findings reveal a significant increase in publications, particularly after 2023, indicating growing global attention to environmental awareness as a priority research topic. Social sciences dominate the field, yet the literature shows strong interdisciplinary expansion involving environmental science, technology, energy, and health. Effective interventions include sustainability-based environmental education, learner-centered and participatory learning, knowledge–attitude–behavior frameworks, and technology-enhanced strategies such as gamification. Key associated variables include educational context, sustainability, environmental knowledge, attitudes, and pro-environmental behavior. Overall, environmental awareness is positioned as a multidimensional educational construct that bridges knowledge and attitudes with responsible environmental action, highlighting the importance of curriculum integration and future longitudinal research.

***Keywords:*** *Environmental Awareness, Bibliometric Analysis, Systematic Literature Review, Scopus*

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## INTRODUCTION

The triple planetary crisis refers to the interconnection between climate change, pollution, and biodiversity loss, which together threaten environmental sustainability and human well-being. Climate change caused by greenhouse gas emissions triggers extreme weather and ecosystem damage, while air, chemical, and plastic pollution damages the quality of the environment and endangers human and wildlife health (Sigmund et al., 2023). At the same time, ecosystem degradation and species extinction reduce nature's ability to

support life, including carbon sequestration and the provision of essential resources. These three crises reinforce each other through various feedback loops, thereby reducing nature's contribution to humans and increasing socio-ecological risks, which underscores the need for integrated policy approaches and interventions (ECHOES et al., 2024).

Various scientific findings show that human activity is the dominant factor causing this damage, so that its management cannot rely solely on technical solutions or regulatory policies. More fundamental changes are needed in the mindset and behavior of society (McNeil, 2023). In this context, environmental awareness is seen as a strategic psychological variable, as it acts as a prerequisite in encouraging sustainable behavior. Therefore, understanding the process of forming and transforming environmental awareness into concrete actions is a key element in supporting the achievement of the Sustainable Development Goals (SDGs). This is consistent with behavioral theories such as the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB), which emphasize that cognitive awareness is a prerequisite for the formation of pro-environmental intentions and actions (Fang et al., 2025; Lucarelli et al., 2020).

As environmental issues become increasingly urgent, scientific studies on environmental awareness show rapid development in the period 2000–2025. In the early stages, particularly during the Millennium Development Goals (MDGs) era, research generally focused on formal environmental education and basic cognitive understanding. However, entering the era of Sustainable Development Goals (SDGs), the research approach has become more comprehensive by involving affective, social, and contextual aspects (Marini Govigli et al., 2022; Marzouki et al., 2021). In the last decade, advances in information technology and the widespread use of social media have changed the way individuals obtain and respond to environmental information. The emergence of phenomena such as digital activism and eco-anxiety shows that environmental awareness is no longer understood as merely ecological knowledge, but also includes attitudes, ethical consumption values, and social and political engagement (Oláh et al., 2020; Shetty & Nayak, 2025).

Although the number of scientific publications on environmental awareness continues to increase, existing studies remain fragmented. Research is scattered across various disciplines, such as education, psychology, management, and sociology, which often use different conceptual frameworks and measurement tools. This situation leads to overlapping understandings and inconsistencies in defining and measuring environmental awareness. In addition, many studies show a knowledge–action gap, where high levels of awareness are not always followed by pro-environmental behavior. These differing findings make it difficult to formulate consistent, evidence-based intervention strategies. Furthermore, there are still limited comprehensive reviews that map the development of the concept of environmental awareness over the past 25 years (2000–2025), including changes in methodological trends and findings, so that a comprehensive understanding of the evolution of this field is still not optimal.

Based on these conditions, a systematic and comprehensive synthesis effort is needed to map scientific developments in the field of environmental awareness. This article

applies a Systematic Literature Review approach to publications published between 2000 and 2025. The analysis focuses on the evolution of research themes, methodological approaches, and key findings that have developed over the past 5 years. Through this synthesis, the study aims to reduce fragmentation in the literature, identify remaining research gaps, and offer an integrative framework that can serve as a basis for further research and the formulation of environmental policies that are more responsive to contemporary challenges. The issues examined in this article are as follows:

1. What are the research trends and publication patterns related to environmental awareness from 2000 to 2025?
2. What teaching approaches or interventions have been reported to be effective in increasing environmental awareness?
3. What variables are most often associated with environmental awareness in the literature?

**Literature Review**

Environmental awareness is a key concept in education and sustainable development, as it plays an important role in shaping individuals' attitudes, values, and behaviors towards the environment. The increase in global issues such as climate change, pollution, and biodiversity degradation makes a comprehensive understanding of environmental awareness important for every individual as part of the environment. This pro-environmental attitude not only emphasizes the aspect of knowledge but also includes affective and behavioral dimensions that encourage individuals to actively participate in environmental rescue and preservation efforts.

In line with advances in interdisciplinary research, researchers define environmental awareness with different focuses and emphases. Some studies emphasize understanding environmental issues, while others highlight motivation and concrete actions to behave in an environmentally friendly and sustainable manner. These differences show that environmental awareness is not a single concept, but consists of various dimensions that are influenced by social factors, education, and individual experiences. Therefore, to gain a more comprehensive understanding, it is important to examine the various definitions of environmental awareness that have been put forward in various literature, as summarized in the following table

Table 1. Definitions of Environmental Awareness from Several Sources

| No | Defining of Environmental Awareness | References |
|---|---|---|
| **1** | Environmental awareness can be understood as the recognition and understanding of environmental issues, which is important for fostering pro-environmental behavior. The simplest model suggests that educating the public about environmental issues leads to increased awareness and concern, which ultimately results in pro-environmental behavior. | Lucarelli et al, 2020 |

| | | |
|---|---|---|
| **2** | Environmental awareness refers to the understanding and recognition of the importance of protecting the environment and promoting sustainable practices. It encompasses educational experiences that aim to reconcile society with nature and encourage sustainable development, as highlighted by initiatives focused on raising awareness of climate action and responsible consumption. | Govigli et al, 2021 |
| **3** | Environmental awareness refers to an understanding of environmental issues and the impact of human activities on the environment. It includes knowledge of issues such as climate change, loss of biodiversity, and pollution, which are increasingly recognized globally as critical problems. | Shetty and Nayak, 2025 |
| **4** | Environmental awareness refers to the understanding and recognition of environmental issues, such as pollution and climate change, and the impact of human activities on the environment. | Marzouki et al, 2021 |

The table above summarizes various definitions of environmental awareness put forward by researchers over time. In general, these definitions emphasize that environmental awareness is not only related to understanding and recognizing environmental issues, but also includes attitudes, concerns, and the drive to behave in an environmentally friendly manner. In addition, this table shows that environmental awareness is seen as the result of a process of education and experience that can encourage sustainable practices, increase responsibility for the impact of human activities, and strengthen the role of individuals and communities in preserving the environment.

## METHOD

A bibliometric-based systematic literature review is used to quantitatively examine a collection of publications in order to reveal research trends, patterns of interrelationships, and central actors and themes in a field of study. Based on frameworks such as PRISMA, this method supports a systematic, transparent, and replicable process of literature search and selection, resulting in a comprehensive mapping of research topic developments. The criteria applied include: (1) articles published until December 2025, (2) scientific works in English, and (3) research focusing on environmental sensitivity in several interdisciplinary fields.

In this study, bibliometric analysis was conducted using VOSviewer software to visualize bibliographic data, including citation networks, author collaborations, and keyword relationships, thereby representing the scientific structure and dynamic development of a research field. The combination of bibliometric analysis and systematic literature review allows researchers to not only synthesize empirical findings but also comprehensively map the research landscape, including identifying research trends that are currently attracting the attention of researchers. The integration of these two approaches

provides a more complete picture of the evolution, journey of related research topics, and prospective directions of the field of study, as well as opening up new avenues for future research.

The initial stages of this study began with the determination of research keywords through a macro (top-down) approach, which involved conducting a broad search before focusing on more specific studies and topics. Considering the limitations of previous studies and the lack of research specifically addressing environmental sensitivity, this study established the term “Environmental Sensitivity” as a keyword applied to the article title, abstract, and keyword section. Furthermore, the Scopus database was used as the main source in this study, both for conducting a literature review, mapping influential researchers, and analyzing trends in research development in related fields.

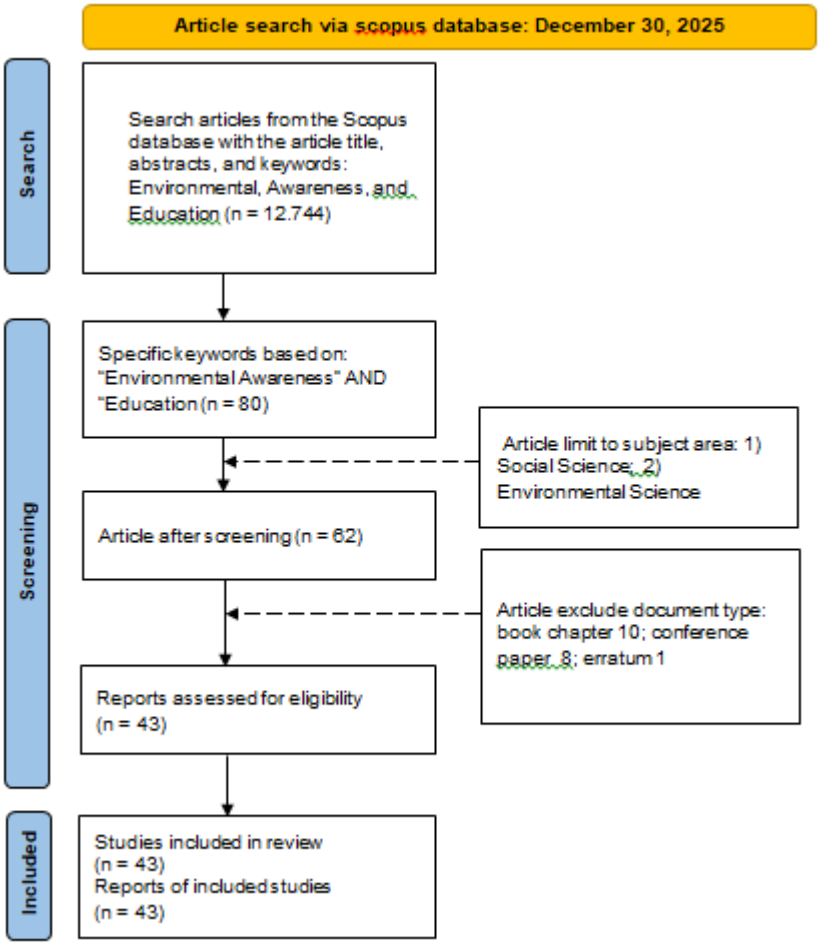


**Figure 1.** PRISMA flow diagram for article search via Scopus database

## FINDING AND DISCUSSION

This study focuses its analysis on findings obtained from 43 articles on Environmental Awareness indexed in the Scopus database. Data was collected through publication mapping, distribution of articles based on year of publication, and the sources of journals containing the research. In addition, this study identifies key elements that contribute significantly to Environmental Awareness studies, including the number of publications, methodological approaches, and research focus.

*RQ 1: What are the research trends and publication patterns related to environmental awareness from 2000 to 2025?*

To see how environmental awareness studies have developed over time, it is important to review the number of publications by year of publication. This annual trend analysis helps to show the level of attention and intensity of research given by academics in a particular period, while also revealing any increase or decrease in interest in the topic. The following graph shows the trend in the number of research publications on environmental awareness in recent years, reflecting the development of research focus in line with the strengthening of sustainability issues and various global environmental challenges.

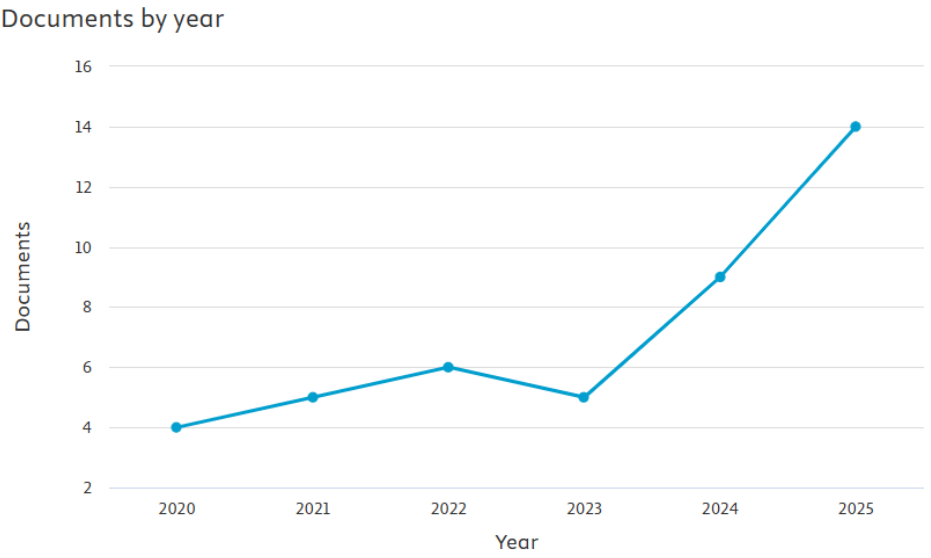


**Figure 2.** Research trends related to environmental awareness in 2020-2025

Figure 2 above shows the number of research publications on environmental awareness in education during the period 2020–2025. In general, there is a noticeable upward trend in the number of articles from year to year, indicating that researchers are paying increasing attention to this topic.

From 2020 to 2022, the number of publications increased slowly from 4 to 6 documents, reflecting the early stages of development of environmental awareness studies

in educational research. This steady increase indicates a growing scientific interest in integrating environmental awareness into the context of education, possibly driven by increased global attention to sustainability and environmental education agendas. Although there was a slight decline to 5 documents in 2023, this condition indicates temporary variation rather than a decline in research interest. This is common in developing research fields and may reflect publication delays or shifts in research focus.

A more significant surge began to appear in 2024, when the number of publications increased to 9 documents and continued to grow to 14 documents in 2025. This sharp increase indicates a stronger focus on environmental awareness in the context of education. This substantial growth also shows an acceleration in the expansion of research on environmental awareness in education, indicating that this topic has become a prominent research priority. This surge may be related to growing global concerns about climate change, sustainability education, and the integration of environmental awareness into curricula, particularly in higher education and STEM-related fields (Pada et al., 2025; Pontificia et al., 2023; Thor & Karlsudd, 2020).

Overall, the data show that environmental awareness in education is a growing field of research. The strong upward trend after 2023 reflects environmental awareness as a key theme in various educational studies and highlights its increasing relevance in addressing environmental and sustainability challenges.

In addition to the growth in publications between 2020 and 2025, the distribution of environmental awareness topics by subject area further clarifies research trends in environmental awareness in education.

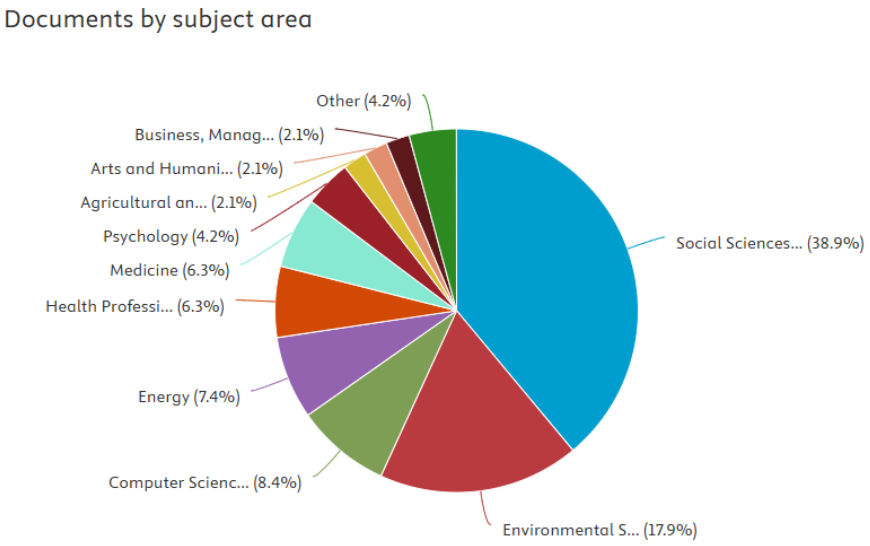


**Figure 3**. Publication trends by research field

As shown in Figure 3, the literature is dominated by Social Sciences, which account for 38.9% of total publications. This dominance indicates that environmental awareness is

most often studied from educational, sociological, and policy-oriented perspectives, emphasizing its role as a social and educational construct rather than merely a technical issue.

The second largest contribution comes from Environmental Science (17.9%), reflecting the strong relationship between environmental awareness and sustainability, conservation, and ecological studies. These findings highlight that research in the field of education often places environmental awareness within the broader framework of the environment and sustainability (Niu et al., 2022; Oe et al., 2022).

Interdisciplinary expansion is evident through contributions from Computer Science (8.4%), Energy (7.4%), and Health-related fields, including Health Professions (6.3%) and Medicine (6.3%). These fields demonstrate a growing interest in technology, energy literacy, and the relationship between health and the environment in the context of environmental awareness. Smaller but significant contributions from Psychology (4.2%), Agricultural and Biological Sciences (2.1%), Arts and Humanities (2.1%), and Business and Management (2.1%) further demonstrate the multidisciplinary nature of environmental awareness research, which encompasses behavioral, cultural, economic, and ethical dimensions.

When viewed alongside the growth trend in publications from 2020 to 2025, the distribution of research fields shows that research on environmental awareness in education has evolved from an environmentally dominated focus to a broad interdisciplinary research domain.

To gain a deeper understanding of efforts to increase environmental awareness, it is important to examine the teaching approaches and interventions that have been applied in various studies. Analysis of learning strategies that have been reported to be effective not only provides an overview of empirically tested best practices, but also forms the basis for formulating pedagogical recommendations relevant to the educational context. Therefore, the following discussion focuses on the research questions:

*RQ 2: 2. What teaching approaches or interventions have been reported to be effective in increasing environmental awareness?*

The keyword network graph in Figure 3 presents a mapping of the interrelationships between the main themes in environmental awareness research based on co-occurrence analysis. This visualization provides an overview of the conceptual structure of the field of study, showing the most dominant keywords and the relationships between topics that are often studied together. Through this graph, it is possible to identify the focus of the research, the grouping of themes, and the direction of the approach used in studying environmental awareness, particularly in the context of education.

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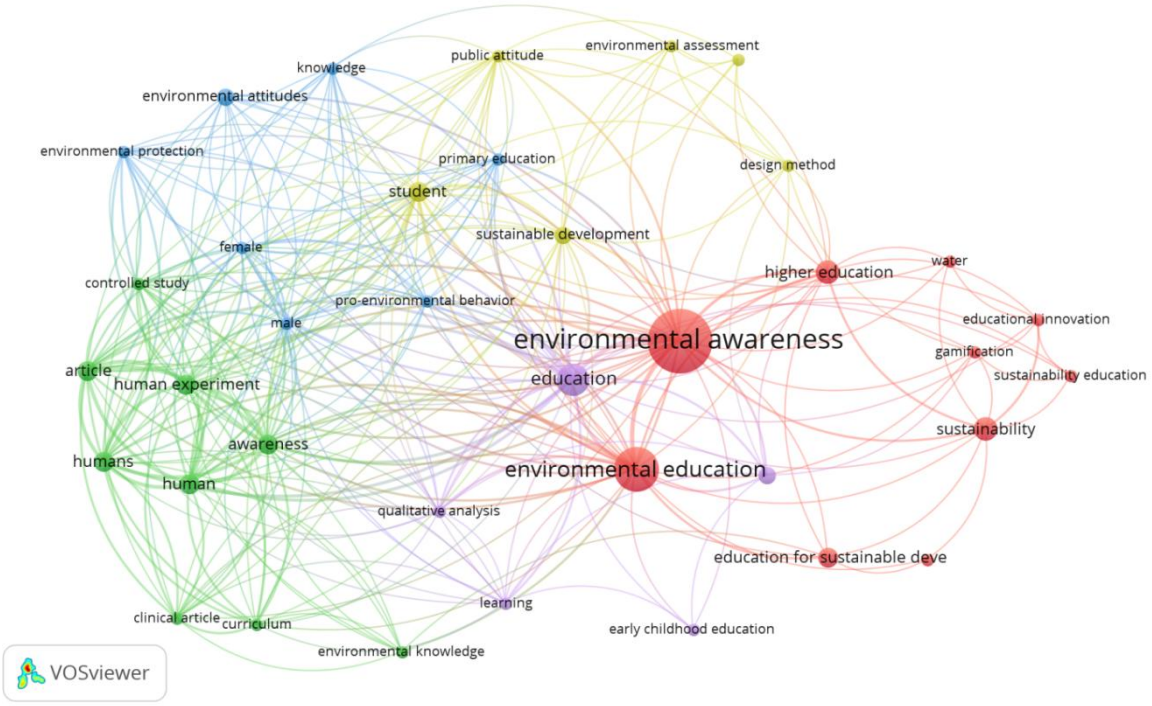


**Picture 4**. VOSviewer keyword co-occurrence network

Based on the co-occurrence network of the keyword VOSviewer, several teaching approaches and interventions related to environmental awareness can be identified through different keyword clusters around the central node of environmental awareness. Each cluster represents the dominant pedagogical orientation used in the literature.

1. Group 1 focuses on environmental education and sustainability. Keyword analysis shows that formal education, especially at the university level, plays a key role in building environmental awareness. This approach prioritizes the integration of environmental issues into the curriculum to strengthen sustainability literacy. Findings confirm that environmental awareness is most effectively built through structured and systematic education programs. (Cederqvist et al., 2025; Kalaycı Alas & Korutürk, 2024).
2. Group 2 emphasized a learner-centered approach tailored to the stage of learning development. These findings highlight the importance of instilling environmental awareness from an early age (including early childhood education) through experience-based learning and reflection. Thus, environmental education is effective when teaching methods are designed in accordance with the age and characteristics of students. (Kanaki et al., 2025; Punzalan & Escalante, 2021).
3. Group 3 highlights the linear relationship between knowledge, attitudes, and behavior. This study views environmental awareness as a gradual process: environmental knowledge shapes positive attitudes, which then trigger pro-environmental behavior. Therefore, the main strategy in this group is learning interventions that specifically target

changing attitudes into concrete actions for environmental protection (De Moya Martínez & Syroyid Syroyid, 2021; Yang et al., 2022).

4. Group 4 emphasized an evidence-based approach through experimental research design. The main focus is to test the effectiveness of the curriculum or learning strategies directly on students (controlled studies). These findings confirm that increased environmental awareness is achieved through structured interventions whose impact is validated objectively and measurably (Saefudin et al., 2025; Yeşilyurt et al., 2020).
5. Group 5 emphasizes participatory learning that connects education with community involvement. The main focus is to make students (especially in primary education) active subjects who interact directly with the social context around them. This approach aims to shape a public attitude that cares about the environment through real learning experiences relevant to sustainable development issues (Pozo-Muñoz et al., 2023; Wang, 2024).
6. Group 6 highlighted the role of innovation and technology in environmental education, such as the use of gamification and creative design methods. This approach aims to boost student motivation and engagement by transforming learning into an interactive experience. Findings indicate that the integration of modern technology-based pedagogy is increasingly vital in making environmental material more interesting and accessible (Kramar & Knez, 2025; Rasyid et al., 2024).

The VOSviewer analysis concludes that the key to increasing environmental awareness lies in sustainability education and a student-centered approach. This strategy is reinforced by the behavior change model (knowledge-attitude-behavior) and innovative methods such as gamification and participatory learning. Overall, these findings confirm that environmental education is most effective when it is integrated, based on real experiences, and applied at all levels of education.

To understand environmental awareness more comprehensively, it is important to examine the variables most frequently associated with the concept in various studies. Identifying key variables not only helps explain the factors that influence the formation and strengthening of environmental awareness, but also provides an overview of the dominant theoretical frameworks in the literature. Therefore, the following discussion focuses on research questions regarding:

*RQ 3:* What variables are most often associated with environmental awareness in the literature?

Based on the keyword co-occurrence network analyzed using VOSviewer, environmental awareness emerged as a central node and had strong links with various variables, indicating that this concept was widely studied in relation to various aspects. The most frequently associated variables can be grouped into several main themes.

**Table 1. Variables Frequently Associated with Environmental Awareness Based on VOSviewer Keyword Clusters**

| Cluster Color | Main Variables (Keywords) | Thematic Focus | Interpretation in Relation to Environmental Awareness |
|---|---|---|---|
| **Red** | Environmental Awareness, Environmental Education, Sustainability, Higher Education, Education for Sustainable Development, Gamification, Educational Innovation, Water | Instructional Approaches & Sustainability Education | Environmental awareness is predominantly studied as an outcome of environmental and sustainability-oriented education, particularly in higher education and through innovative instructional strategies. |
| **Yellow** | Sustainable Development, Public Attitude, Student, Primary education, Environmental Assessment, Design Method | Sustainability & Learner-Oriented Education | Environmental awareness is linked to students' attitudes and learning processes, supporting its role in achieving sustainable development goals through education. |
| **Blue** | Environmental Attitudes, Environmental Protection, Knowledge, Pro-Environmental Behavior, Male, Female | Cognitive–Affective–Behavioral Variables | Environmental awareness is frequently associated with knowledge and attitudes, and positioned as a precursor to pro-environmental behavior. |
| **Green** | Awareness, Environmental Knowledge, Humans, Human Experiment, Controlled Study, Curriculum, Clinical Article | Human-Centered & Empirical Research Context | The literature emphasizes human subjects and empirical interventions, framing environmental awareness as a measurable psychological and educational construct. |
| **Purple** | Education, Learning, Qualitative Analysis, Early Childhood Education | Learning Processes & Educational Stages | Environmental awareness is examined across learning processes and educational levels, including early childhood, highlighting its developmental dimension. |

Overall, the five clusters show that environmental awareness is understood as a multidimensional concept in education. Environmental awareness is not only positioned as the result of innovative learning approaches and instructional strategies, but is also closely related to the attitudes, knowledge, and learning processes of students that encourage pro-environmental behavior. Furthermore, empirical studies confirm environmental awareness as a psychological construct that can be measured and developed at various levels of

education, including from an early age, thus demonstrating its strategic role in supporting sustainable education. VOSviewer analysis shows that 'environmental awareness' is closely related to four main pillars: educational variables (methods and levels), sustainability issues, psychological aspects (knowledge and attitudes), and concrete actions (pro-environmental behavior). These findings conclude that environmental awareness is a result of education. It is this educational process that bridges the transformation from simply 'knowing' and 'caring' (knowledge & attitudes) to concrete actions that are responsible towards nature.

## CONCLUSION

Based on a systematic literature review of 43 Scopus-indexed articles, this study shows that research on environmental awareness in education has increased significantly, especially in the period 2020–2025, with a surge in publications after 2023. These findings confirm the increasingly strong position of environmental awareness as a strategic theme in responding to global issues such as sustainability and climate change, as well as the development of this study in a multidisciplinary manner with a dominance of social sciences.

From a pedagogical perspective, the increase in environmental awareness is mostly achieved through sustainability-based environmental education, learner-centered learning, and a knowledge-attitude-behavior approach, supported by participatory and innovative strategies such as gamification. The most frequently associated variables include educational context, sustainability, knowledge, attitudes, and pro-environmental behavior, indicating that environmental awareness is understood as an educational construct that mediates changes in attitudes and behavior. These findings underscore the importance of strengthening the integration of environmental awareness in the curriculum and open up opportunities for further research, particularly through longitudinal studies and the development of more consistent and innovative learning intervention designs.

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