Education for Sustainability in Greek Early Childhood Education and Care: educators' perceptions, implementation practices, and barriers

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ABSTRACT
This study examines Greek early childhood educators' perceptions, practices, and barriers related to Education for Sustainability (EfS) in Early Childhood Education and Care (ECEC). A quantitative research was conducted, using a structured questionnaire administered to 121 early childhood educators working in public and private ECEC settings across Greece. Findings indicate that while educators reported positive views of EfS, its application is inconsistent. The common practices that were highlighted include play-based learning, storytelling, recycling, and outdoor activities, while reported barriers involve limited resources, insufficient materials, institutional constraints, and lack of professional training. The study suggests the need for clear curricula, targeted training, and stronger institutional support.

KEY WORDS
Education for Sustainability, Early Childhood Education and Care, Greece, educators' perceptions pedagogical practices, barriers

RÉSUMÉ
Cette étude examine les perceptions, les pratiques et les obstacles des éducateurs de la petite enfance grecs concernant l'éducation au développement durable (EfS) dans l'enseignement et la garde de la petite enfance (ECEC). Une recherche quantitative a été menée à l'aide d'un questionnaire structuré administré à 121 éducateurs de la petite enfance travaillant dans des établissements publics et privés à travers la Grèce. Les résultats montrent que, bien que les éducateurs aient généralement une vision positive de l'EfS, son application reste incohérente. Les pratiques courantes mises en avant incluent l'apprentissage par le jeu, le conte, le recyclage et les activités en plein air, tandis que les obstacles signalés concernent des ressources limitées, des matériaux insuffisants, des contraintes institutionnelles et un manque de formation professionnelle. L'étude souligne la nécessité de programmes clairs, de formations ciblées et d'un soutien institutionnel renforcé.

MOTS-CLÉS
Éducation au Développement Durable, Éducation et soins de la petite enfance, Grèce, perceptions des éducateurs, pratiques pédagogiques, obstacles

RATIONALE OF THE STUDY

During recent decades, environmental degradation has increasingly emerged as one of the most pressing challenges faced by contemporary societies. Human intervention in natural ecosystems, combined with increasing socio-economic demands and consumption patterns, has contributed to a wide range of global environmental problems, such as climate change, waste accumulation, microplastics, pandemics, migration and social inequality, with significant consequences for ecosystems and human well-being (Ali & Rahman, 2024; Gills & Morgan, 2022; Saxena, 2025). Understanding the causes of environmental deterioration and identifying ways to address these challenges has therefore become a central concern for modern societies. Addressing such complex issues requires collective efforts involving governments, institutions and educational systems (Evans & Thomas, 2023).

Considering these, promoting responsible environmental attitudes and behaviors appears essential for supporting policies and practices that aim to protect natural ecosystems and promote sustainable development (Shah & Asghar, 2024). Sustainable development has been defined in various ways in the literature, however, one of the most widely recognized definitions originates from the 1987 report *Our Common Future*, published by the World Commission on Environment and Development (Brundtland Commission), which describes it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Building on this foundational definition, sustainable development is generally understood as encompassing efforts to maintain and protect the Earth's ecosystems while balancing environmental, social, and economic dimensions in ways that safeguard human well-being (Ghimire, 2023; Ruggiero, 2021).

Given the complexity and multidimensional nature of sustainable development, education plays a central role for enabling individuals to understand and address environmental and socio-economic challenges in informed and responsible ways (Vladova, 2023). Within this context, Education for Sustainability (EfS) is an approach that has gained increasing attention in this regard, and aims to promote knowledge, values, and behaviors that support sustainable development (Boeve-de Pauw et al., 2015; González-Gaudiano, 2005; Venkataraman, 2009). As EfS becomes more prominent within educational discourse and practice, the role of educators is increasingly emphasized, as they are central to its implementation and to fostering sustainability-related knowledge and attitudes (Crespo-Martín et al., 2025; Obiagu et al., 2024).

Considering these, early childhood has increasingly been recognized as an important stage for EfS. Young children represent future citizens who will be required to address complex environmental and social challenges (Güler Yıldız et al., 2021). Research also highlights the benefits of children's engagement with nature and sustainability-related activities early in life, as such experiences may facilitate the development of environmental awareness, social responsibility and positive environmental attitudes (Karacabey et al., 2025; Vodopivec & Šindic, 2025).

International organizations such as UNESCO (2017) emphasize that sustainability-oriented activities implemented in Early Childhood Education and Care (ECEC) settings may foster children's interest in environmental issues and support the development of ecological awareness. Through appropriate and student-centered pedagogical approaches, such as project/problem/inquiry based learning, experiential learning (Kokotsaki et al., 2016; Larmer et al., 2015; Singha & Singha, 2024; Solomon, 2003), or outdoor learning (Anjarwani et al., 2020; Ayotte-Beaudet et al., 2023), sustainability-related values and behaviours may gradually begin to develop from early childhood (Stavreva Veselinovska et al., 2025).

However, this is not always the case. Although the importance of EfS is widely recognized, its systematic integration in ECEC still appears to remain limited in several educational contexts (Davis & Davis, 2021; Davis & Elliott, 2023). From this perspective, it

would be meaningful to understand how early childhood educators perceive EfS, how it is implemented in everyday educational practice, and what barriers prevent its incorporation.

THEORETICAL BACKGROUND

Education for Sustainability

Education for Sustainability (EfS) refers to an educational approach that seeks to equip learners with the knowledge, skills, values, and attitudes needed to contribute to a more sustainable future, by addressing interconnected environmental, social, and economic challenges (UNESCO, 2017). Within this framework, EfS is widely regarded as a key pathway for fostering environmentally responsible citizens, who can act in environmentally sustainable ways (Boeve-de Pauw et al., 2015; González-Gaudiano, 2005; Juuti et al., 2021; Venkataraman, 2009). EfS therefore extends beyond environmental knowledge alone and addresses broader aspects such as social justice and responsible citizenship (Pennell & Sabau, 2024), which requires transforming educational practices and creating learning environments that reflect sustainability principles (Sass et al., 2024).

Research further indicates that EfS may contribute to the development of sustainability awareness, behavioural responsibility and critical thinking skills (Ekamilasari et al., 2021). In other words, EfS is often described as a holistic and interdisciplinary educational approach that promotes critical thinking, problem solving and learner-centred pedagogical practices. It encourages dialogue between different forms of knowledge, connects theory with practice and emphasizes action in addressing complex environmental and social issues (Sass et al., 2024). In this sense, EfS is often described as a transformative educational approach that focuses not only on what learners should learn about sustainability, but also on how learning processes can support meaningful change (Springett, 2015).

Considering the importance of EfS, increasing attention has been given to its implementation in ECEC. Research indicates that early engagement with environmental and social concepts may support the development of environmental awareness and responsible attitudes later in life (Davis & Elliott, 2023). Consequently, EfS is increasingly viewed as a priority within ECEC (Davis et al., 2024; Dean & Elliott, 2022; Engdahl & Furu, 2022; Evans et al., 2022; Furu & Heilala, 2021; Güler Yıldız et al., 2021; Mukhlis et al., 2024; Mutiarasari et al., 2025; Ohlsson et al., 2022; Vodopivec & Šindic, 2025).

Recent research suggests that early exposure to sustainability-related experiences may support children in developing an initial understanding of their relationship with society and the environment, while also fostering responsible attitudes from an early age (Davis et al., 2024; Dean & Elliott, 2022; Engdahl & Furu, 2022; Kasimati & Ergazaki, 2019; Vodopivec & Šindic, 2025). In response, many educational systems worldwide promote holistic approaches that frame the environment as a system of interconnected relationships (Furu & Heilala, 2021; Ohlsson et al., 2022; Vodopivec & Šindic, 2025). Within this perspective, educational practices often emphasize helping children recognize that their actions can influence both present and future environmental conditions (Sass et al., 2024). Such approaches reflect a broader international shift toward appropriate pedagogical methods of EfS, in all educational levels (Davis et al., 2024).

Aligned with this shift, a range of active learning strategies has been proposed as appropriate for EfS, including role-playing, simulations, group discussions, case studies, and reflective practices (Horodyskyj et al., 2024; Howell, 2021; Novaes, 2025). In ECEC contexts, these approaches are often complemented by creative methods, such as storytelling, puppetry, and dramatization, which introduce sustainability-related concepts in developmentally

appropriate and meaningful ways for young children (Furu et al., 2021; Mavrić & Skenderović, 2021; Ärlemalm-Hagsér et al., 2021).

Early childhood educators and the implementation of education for Sustainability

Early childhood educators' knowledge and attitudes are considered important factors for the successful implementation of EfS in early years. Educators require both content knowledge and appropriate pedagogical strategies in order to effectively integrate sustainability concepts into teaching practices (Kahriman Pamuk et al., 2026).

However, the literature suggests that although early childhood educators may possess basic knowledge regarding sustainability, they may not fully understand the interconnections between environmental, social and economic dimensions (Hamatsu, 2024; Ismail et al., 2026). More specifically, several studies indicate that early childhood educators tend to emphasize more the environmental dimension, than the social and economic aspects of sustainability (Borg & Gericke, 2021; Kahriman Pamuk et al., 2026).

Early childhood educators' education also appears to influence educators' readiness to teach sustainability-related concepts. Although they may possess theoretical knowledge about sustainability, early childhood educators often report feeling insufficiently prepared to integrate sustainability concepts into classroom practice (Anyanwu, 2023; del Carmen Pegalajar-Palomino et al., 2021). At the same time, educators' beliefs regarding their own teaching abilities, as well as their beliefs about EfS itself, may significantly influence their teaching practices (Anyanwu, 2023; Kahriman Pamuk et al., 2026; Vikane & Høydalsvik, 2024).

Furthermore, positive attitudes toward sustainability do not necessarily translate into effective teaching practices (Ismail et al., 2026). Strengthening early childhood educators' knowledge and pedagogical competence may therefore increase their confidence and willingness to address sustainability issues in the classroom (Borg & Gericke, 2021).

Early childhood educators therefore appear to play a crucial role in facilitating children's exploration of sustainability-related ideas. Their role involves encouraging participation, supporting inquiry and promoting collaborative learning processes (Anyanwu, 2023; Engdahl et al., 2021). Through such child-centred pedagogical approaches, early childhood education and care may contribute to the development of environmentally responsible future citizens.

However, despite its recognized importance (Hedefalk et al., 2015), the integration of EfS in Greek ECEC still appears relatively limited. Several factors may contribute to this situation. One challenge concerns the lack of clear curricular guidance regarding appropriate ways of introducing sustainability concepts in early childhood settings (Faeruz et al., 2026; Weldemariam et al., 2017). As a result, educators may feel uncertain about how EfS can be effectively incorporated into everyday teaching practices. Another challenge relates to the complexity of sustainability concepts, which are sometimes considered too abstract for young children (Sobel, 2025).

Research in the Greek context, although limited, indicates that sustainability-related activities in early childhood settings often focus primarily on nature-related topics such as plants and animals, while broader sustainability programmes are implemented less frequently (Kasimati & Ergazaki, 2019). Teaching practices tend to emphasize environmental themes without sufficiently addressing the social and economic dimensions of sustainability (Bourotzoglou et al., 2016; Tsevreni et al., 2023), and recycling activities are commonly implemented without deeper engagement with the wider environmental issues involved (Mavrokefalidou & Siatras, 2026).

Despite the growing importance of EfS in ECEC, research examining early childhood educators' perspectives regarding EfS in the Greek context remains limited (Petkou et al., 2025). This lack of empirical evidence constrains a comprehensive understanding of how EfS is interpreted and enacted in Greek ECEC settings, as well as the challenges educators face in

its implementation. To address this gap, the present study investigates early childhood educators' perceptions, practices, and perceived barriers related to EfS in Greece.

Objectives and Research Questions

Building on the above, the present study explores early childhood educators' perceptions of EfS and examines the extent to which they integrate it into their everyday educational practice, in Greek ECEC settings. In addition, the study investigates the pedagogical methods used to introduce EfS-related concepts and explores the barriers encountered during the implementation of EfS in educational practice.

More specifically, the research questions addressed in this study are the following:

1. What are Greek early childhood educators' perceptions of Education for Sustainability?
2. To what extent do early childhood educators in Greece integrate Education for Sustainability into their everyday educational practice?
3. Which pedagogical methods do early childhood educators use to introduce concepts related to Education for Sustainability in Greek early childhood education and care settings?
4. What barriers do early childhood educators face when implementing Education for Sustainability in Greek early childhood education and care settings?

METHODS

Overview of study

This study employed a quantitative research design to explore early childhood educators' perceptions of EfS, A quantitative approach was considered appropriate given the exploratory nature of the study and its aim to capture a broad range of perspectives from educators working in ECEC settings (Clark et al., 2021; Creswell & Creswell, 2017; Johnson & Christensen, 2024). A non-probability convenience sampling was used to recruit participants who were directly involved in ECEC (Etikan et al., 2016; Golzar et al., 2022; Sarker & Al-Muaalemi, 2022). More specifically, the sample consisted of 121 early childhood educators working in public and private ECEC settings in Greece, including kindergartens and childcare centers. Participants ranged in age from 22 to 65 years and included both male and female educators.

Educators who agreed to participate were invited to complete an online questionnaire via a provided link at their convenience. The questionnaire required approximately 10-15 minutes to complete. Prior to answering the questionnaire, participants were presented with an information sheet and a consent form. Participation was anonymous and voluntary, and participants had the right to withdraw at any time. No personal data were collected, and all responses were stored securely and used exclusively for the purposes of the research (Atenas et al., 2023; Jones, 2012; Swain, 2016).

Questionnaire

Data were collected through a structured questionnaire, which consisted of 44 questions addressed to early childhood educators regarding their perspectives related to EfS. The first four questions collected demographic information, while the remaining items focused on educators' perceptions of EfS, the extent to which they implement it in educational practice, the teaching methods they used and the barriers they encounter during its implementation.

More specifically, following the demographic questions, the remaining items corresponded directly to the research questions:

1. Questions 5-11 addressed the first research question: "*What are Greek early childhood educators' perceptions of Education for Sustainability?*". These items explored

educators' understanding of the concept of Education for Sustainability, as well as their views regarding its importance in early childhood education and care.

2. Questions 12-18 corresponded to the second research question: "*To what extent do early childhood educators in Greece integrate Education for Sustainability into their everyday educational practice?*". These items examined the extent to which sustainability-related practices are incorporated into educators' daily practice.
3. Questions 19-31 addressed the third research question: "*Which pedagogical methods do early childhood educators use to introduce concepts related to Education for Sustainability in Greek early childhood education and care settings?*". These items focused on the teaching strategies and pedagogical approaches used by educators to introduce and develop sustainability-related concepts within early childhood classrooms.
4. Questions 32-44 corresponded to the fourth research question: "*What barriers do early childhood educators face when implementing Education for Sustainability in Greek early childhood education and care settings?*". These items examined the challenges and constraints that educators encounter when attempting to integrate sustainability-related topics into their educational practice.

The questionnaire consisted primarily of Likert-type items. Participants were asked to indicate their responses using five-point scales, which varied depending on the content of each item. These included agreement scales (ranging from "Strongly disagree" to "Strongly agree"), extent scales (from "Not at all" to "Very large extent"), and frequency scales (from "Not used" to "Very often"). In addition, a small number of dichotomous questions (Yes/No) were included. The items were formulated as statements describing beliefs, practices, and perceived barriers related to EfS in ECEC.

The questionnaire was developed based on relevant literature on EfS and early childhood education (Zwickle & Jones, 2018), ensuring alignment with key theoretical constructs. Attention was given to clarity, relevance, and alignment with the research objectives, following established principles of questionnaire design (Doran et al., 2026). A pilot study was conducted with 10 early childhood educators to assess the clarity and comprehensibility of the items. Minor revisions were made based on participants' feedback, enhancing the overall validity and usability of the instrument.

Data Analysis

The collected data were analysed using descriptive statistical methods. Frequencies and percentages were calculated to summarize participants' responses and identify patterns related to the research questions.

Given the exploratory nature of the study and the descriptive focus of the research questions, descriptive statistics were considered appropriate to present the distribution of responses across the different questionnaire items, providing an overview of educators' perceptions, practices, and perceived barriers regarding the implementation of EfS in ECEC settings in Greece (Alabi & Bukola, 2023).

RESULTS

Demographic characteristics of participants

A total of 121 early childhood educators participated in the study, and their demographic characteristics are presented in Table 1. The majority of respondents were female (81%), while 19% were male. Most participants were relatively young, with 46.3% aged 22-29 and 40.5% aged 30-39. In terms of teaching experience, 71.1% reported having between 1 and 10 years of

experience. Regarding educational background, most participants held a bachelor's degree (57%), followed by 38.8% who held a master's degree and 4.1% who held a doctoral degree.

TABLE 1

Demographic characteristics of participants (N=121)

Variable	Category	n	%
Gender	**Female**	98	81%
	Male	23	19%
Age	**22-29**	56	46.3%
	30-39	49	40.5%
	40-49	7	5.8%
	50-59	8	6.6%
	60+	1	0.8%
Years of teaching experience	**1-10 years**	86	71.1%
	11-20 years	26	21.5%
	21-30 years	7	5.8%
	31+ years	2	1.7%
Educational level	**Bachelor's degree**	69	57%
	Master's degree	47	38.8%
	Doctoral degree	5	4.1%

Perceptions of Greek early childhood educators regarding Education for Sustainability

Participants (N = 121) reported positive perceptions of EfS (Table 2).

TABLE 2

Educators' perceptions regarding EfS (N=121)

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)
EfS promotes learners' autonomy	0 (0%)	1 (0.8%)	7 (5.8%)	40 (33.1%)	73 (60.3%)
EfS encourages students' active participation	0 (0%)	0 (0%)	2 (1.7%)	38 (31.4%)	81 (66.9%)
EfS applies experiential pedagogical approaches	0 (0%)	1 (0.8%)	5 (4.1%)	40 (33.1%)	75 (62%)
EfS promotes understanding of the complexity of environmental issues	0 (0%)	2 (1.7%)	4 (3.3%)	36 (29.8%)	79 (65.3%)
EfS addresses global challenges (e.g., climate change, poverty, inequalities)	0 (0%)	0 (0%)	7 (5.8%)	38 (31.4%)	76 (62.8%)
Educators implementing EfS should demonstrate values such as solidarity and responsibility	0 (0%)	1 (0.8%)	5 (4.1%)	40 (33.1%)	75 (62%)

The majority agreed or strongly agreed that EfS promotes learners' autonomy (93.4%). Similarly, almost all participants (98.3%) recognized that EfS encourages students' active participation in the learning process, as they agreed or strongly agreed with this statement.

Participants also acknowledged main aspects of EfS related to both pedagogy and learning outcomes. Specifically, 95.1% of respondents agreed or strongly agreed that EfS incorporates experiential pedagogical approaches in teaching and learning processes. Similarly, an equal proportion (95.1%) recognized its role in promoting understanding of complex environmental issues. Furthermore, educators demonstrated strong awareness of the broader social and global aspects of EfS. A large majority (94.2%) agreed or strongly agreed that EfS addresses global challenges such as climate change, poverty, and social inequalities.

Finally, participants emphasized the importance of educators' values in the implementation of EfS. Specifically, 95.1% of respondents agreed or strongly agreed that educators involved in EfS should demonstrate values such as solidarity, responsibility, and respect for living beings. Overall, the findings indicate that early childhood educators hold positive perceptions of the principles and objectives of EfS.

Integration of Education for Sustainability in Early Childhood Education and Care settings in Greece

Participants reported varying levels of integration of EfS in ECEC settings (Table 3).

TABLE 3

Integration of EfS in ECEC Settings in Greece (N=121)

Item	Not at all n (%)	To a small extent n (%)	Moderate extent n (%)	Large extent n (%)	Very large extent n (%)
Integration of sustainability into educational programs	7 (5.8%)	26 (21.5%)	31 (25.6%)	44 (36.4%)	13 (10.7%)
Integration of EfS is considered necessary in ECEC	1 (0.8%)	1 (0.8%)	13 (10.7%)	75 (62%)	31 (25.6%)
Promotion of critical thinking through EfS activities	1 (0.8%)	3 (2.5%)	27 (22.3%)	63 (52.1%)	27 (22.3%)
Addressing local sustainability issues in educational activities	0 (0%)	10 (8.3%)	23 (19%)	64 (52.9%)	24 (19.8%)
Integration of children's participation in decision-making within EfS activities	1 (0.8%)	8 (6.6%)	24 (19.8%)	65 (53.7%)	23 (19%)
Integration of outdoor learning within EfS-related activities	1 (0.8%)	8 (6.6%)	19 (15.7%)	63 (52.1%)	30 (24.8%)

Specifically, 36.4% indicated that EfS is largely integrated, while 25.6% reported a moderate level of integration. A smaller proportion of participants (10.7%) reported high levels of integration, whereas 21.5% indicated that EfS is incorporated to a limited extent. Participants also expressed strong agreement regarding the importance of integrating EfS into ECEC. Most respondents considered integration of EfS to be important (62%), or very important (25.6%).

Regarding the integration of EfS into everyday educational practice, many educators reported promoting critical thinking through sustainability-oriented activities. Specifically,

52.1% indicated that they encourage critical thinking to a large extent, while 22.3% reported doing so to a very large extent. Similarly, educators frequently reported addressing local sustainability issues in their educational practices. More than half of the participants (52.9%) indicated that they address such issues to a large extent, while 19.8% reported doing so to a very large extent.

Moreover, the inclusion of children's participation in decision-making within EfS activities was also widely reported. In particular, 53.7% of respondents indicated that such practices are implemented to a large extent, while 19% reported implementation to a very large extent. Finally, outdoor learning was identified as an important component of EfS implementation. More than half of the participants (52.1%) reported integrating outdoor learning activities to a large extent, while 24.8% indicated doing so to a very large extent.

Pedagogical methods used to introduce concepts related to Education for Sustainability

Early childhood educators reported frequent use of a wide range of pedagogical approaches when introducing concepts related to EfS in ECEC (Table 4).

TABLE 4

Pedagogical methods used to introduce EfS concepts in ECEC (N=121)

Teaching method	Not used n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Very often n (%)
Play with natural materials (e.g., water, sand, soil)	2 (1.7%)	8 (6.6%)	19 (15.7%)	62 (51.2%)	30 (24.8%)
Recycling activities (e.g., paper, water, materials)	1 (0.8%)	2 (1.7%)	18 (14.9%)	67 (55.4%)	33 (27.3%)
Arts and crafts activities	0 (0%)	5 (4.1%)	18 (14.9%)	65 (53.7%)	33 (27.3%)
Project-based learning	2 (1.7%)	6 (5%)	26 (21.5%)	62 (51.2%)	25 (20.7%)
Educational excursions / outdoor activities	3 (2.5%)	14(11.6%)	23 (19%)	54 (44.6%)	27 (22.3%)
Experiential play	0 (0%)	5 (4.1%)	20 (16.5%)	67 (55.4%)	29 (24%)
Drama activities	3 (2.5%)	13 (10.7%)	22 (18.2%)	57 (47.1%)	26 (21.5%)
Storytelling and reflection activities	1 (0.8%)	3 (2.5%)	23 (19%)	62 (51.2%)	32 (26.4%)

Play with natural materials, such as water, sand, and soil, was among the most commonly used strategies, with 51.2% of respondents reporting frequent use and 24.8% indicating very frequent use. Recycling activities were also widely implemented, as 55.4% of educators reported using them often and 27.3% very often when introducing sustainability concepts. Similarly, arts and crafts activities were frequently employed, with 53.7% of respondents indicating frequent use and 27.3% reporting very frequent use.

Project-based learning was another commonly reported approach, with 51.2% of participants indicating that they use it often and 20.7% reporting very frequent use. Educational excursions and outdoor activities were also utilized by many educators, with 44.6% reporting frequent use and 22.3% very frequent use in sustainability-related learning contexts. At the same time, experiential play emerged as a widely adopted pedagogical strategy. A majority of respondents (55.4%) reported using it frequently, while 24% indicated very frequent use. Drama activities were also employed by a substantial proportion of educators, with 47.1% reporting frequent use and 21.5% very frequent use.

Finally, storytelling and reflection activities seem to widely be integrate into EfS. More than half of the participants (51.2%) reported using these approaches frequently, while 26.4% indicated very frequent use. Overall, the findings suggest that Greek early childhood educators employ a diverse range of interactive and experiential pedagogical strategies when introducing concepts related to EfS in ECEC settings.

Barriers to the implementation of Education for Sustainability

Participants were asked to evaluate several potential barriers and professional development issues related to the implementation of EfS in ECEC (Table 5).

TABLE 5

Barriers related to EfS implementation (N=121)

Potential barrier / training issue	Not at all n (%)	To a small extent n (%)	Moderate extent n (%)	Large extent n (%)	Very large extent n (%)
Lack of resources	1 (0.8%)	3 (2.5%)	17 (14%)	70 (57.9%)	30 (24.8%)
Lack of supporting materials	1 (0.8%)	3 (2.5%)	10 (8.3%)	72 59.5%)	35 (28.9%)
Institutional barriers	1 (0.8%)	5 (4.1%)	17 (14%)	68 (56.2%)	30 (24.8%)
Social barriers	1 (0.8%)	7 (5.8%)	26 (21.5%)	62 (51.2%)	25 (20.7%)
Political barriers	6 (5%)	6 (5%)	20 (16.5%)	60 (49.6%)	29 (24%)
Training on EfS concepts and theoretical foundations	4 (3.3%)	18 (14.9%)	48 (39.7%)	37 (30.6%)	14 (11.6%)
Training on EfS aims and objectives	3 (2.5%)	23 (19%)	49 (40.5%)	34 (28.1%)	12 (9.9%)
Training on EfS teaching methods	6 (5%)	23 (19%)	49 (40.5%)	33 (27.3%)	49 (40.5%)
Adequate support with educational materials related to Education for Sustainability	25 (20.7%)	41 (33.9%)	39 (32.2%)	14 (11.6%)	2 (1.7%)

The findings indicate that limited resources represent a significant challenge for many educators. In particular, 57.9% of respondents reported that lack of resources constitutes a barrier to a large extent, while 24.8% indicated that it represents a barrier to a very large extent. Similarly, lack of supporting materials emerged as an important obstacle to the implementation of EfS activities. The majority of participants reported that insufficient materials constitute a barrier to a large (59.5%) or very large extent (28.9%).

Institutional barriers were also frequently reported by participants. More specifically, 56.2% of educators indicated that institutional constraints affect the implementation of sustainability-related activities to a large extent, while 24.8% reported high levels of impact. Social barriers were also identified as a relevant factor affecting EfS implementation. Over half of the respondents (51.2%) reported that social barriers influence implementation to a large extent, while 20.7% indicated a very large extent. Political barriers were also acknowledged by many educators, with 49.6% reporting that political factors affect the implementation of EfS to a large extent and 24% to a very large extent.

In terms of professional development, participants reported moderate levels of training related to EfS. Specifically, 39.7% indicated moderate levels of training regarding EfS concepts and theoretical foundations, while 30.6% reported training to a large extent. Similarly, most respondents reported moderate levels of training regarding the aims and objectives of EfS

(40.5%), while 28.1% reported higher levels of training. Comparable patterns were observed for training related to EfS teaching methods, with 40.5% of participants indicating moderate levels of training and 27.3% reporting higher levels.

Finally, participants reported limited support through educational materials related to EfS. Specifically, most respondents indicated receiving support to a small (33.9%) or moderate extent (32.2%), while only a small proportion reported receiving such support to a large (11.6%) or very large extent (1.7%). Overall, the findings suggest that early childhood educators face several structural and professional challenges when implementing EfS, particularly related to limited resources, insufficient institutional support, and moderate levels of professional training.

DISCUSSION

The present study examined early childhood educators' perceptions, practices, and perceived barriers regarding the implementation of Education for Sustainability (EfS) in Greek Early Childhood Education and Care (ECEC) settings. Addressing a limited body of research in the Greek context, the findings offer insight into how EfS is currently understood and enacted. Overall, the results suggest that although educators express positive views toward EfS, its implementation appears uneven and influenced by structural and contextual factors (Davis & Elliott, 2023; Ohlsson et al., 2022).

With regard to early childhood educators' perceptions, participants generally associated EfS with learner participation, experiential learning, and engagement with environmental and social issues. Educators also acknowledged the broader scope of EfS, including global challenges such as climate change and social inequalities, reflecting the multidimensional nature of sustainable development (Ghimire, 2023; Ruggerio, 2021). These findings suggest that educators move beyond a narrow environmental interpretation of EfS and exhibit an awareness of its holistic nature. This is consistent with previous research indicating that educators generally express positive attitudes toward EfS and recognize its importance for fostering responsible and informed citizens (del Carmen Pegalajar-Palomino et al., 2021; Kahriman Pamuk et al., 2026; Obiagu et al., 2024). However, a more cautious interpretation is warranted. The findings reflect self-reported perceptions and may indicate a general alignment with dominant educational discourse rather than a fully developed pedagogical understanding. In this sense, the extent to which these perceptions are translated into practice remains an open question.

This issue becomes more evident considering that, despite this positive attitude, the findings indicate that the integration of EfS into educational practice is neither systematic nor consistent. While a considerable proportion of educators reported implementing sustainability-related activities to a large extent, a notable number indicated only moderate or limited integration. This variability reflects a discrepancy between educators' beliefs and their instructional practices. In line with previous studies, the findings suggest that positive perceptions alone are insufficient to ensure effective implementation (Davis & Elliott, 2023), which also requires more structured and clearly defined curricular guidance, to help educators translate their knowledge and attitudes into consistent classroom practice (Dean & Elliott, 2022; Ohlsson et al., 2022). Similar gaps between knowledge, attitudes, and behaviors have also been identified in teacher education research (Crespo-Martín et al., 2025). Instead, the translation of EfS into practice appears to depend on contextual conditions, including institutional support, availability of resources, and educators' preparedness (Evans et al., 2022). In the Greek context, this inconsistency may also reflect the absence of clear curricular guidance and structured support EfS, as highlighted in earlier research (Bourotzoglou et al., 2016; Tsevreni et al., 2023).

The pedagogical approaches reported in this study further contribute to understanding how EfS is enacted in practice. Educators frequently refer to experiential and play-based methods, including activities with natural materials, recycling, and arts-based approaches. These practices align with early childhood pedagogy and are commonly associated with EfS (Furu & Heilala, 2021; Sobel, 2025). At the same time, their prominence may indicate that sustainability is often approached through concrete and activity-based experiences. While such approaches are appropriate for young learners, they may not necessarily support engagement with the broader social and economic dimensions of sustainability (Borg & Gericke, 2021). This interpretation is consistent with previous findings in the Greek context, where EfS has been found to focus primarily on environmental themes while the inclusion of other dimensions of sustainability remains limited (Bourotzoglou et al., 2016; Kasimati & Ergazaki, 2019; Tsevreni et al., 2023).

The barriers identified by participants point to structural constraints affecting EfS implementation. Limited resources, lack of supporting materials, institutional challenges, and moderate levels of professional training were all reported as influencing practice. These findings suggest that the challenges associated with EfS are not limited to individual educators but relate to broader systemic conditions. In particular, the reported levels of training may indicate that educators have limited opportunities to develop the pedagogical and conceptual knowledge required for integrating EfS in a more comprehensive way. Similar issues have been highlighted in previous research (Anyanwu, 2023; Borg & Gericke, 2021; Evans et al., 2022; Vikane & Høydalsvik, 2024;).

The findings have several implications for the Greek ECEC context. Beyond confirming trends identified in international literature, the present study highlights a context-specific pattern in the Greek ECEC system, where EfS appears to be predominantly enacted through activity-based and environmentally focused practices, rather than as a holistic and integrated pedagogical approach. This pattern reflects a gap between educators' positive perceptions of EfS and its partial and fragmented implementation in practice. In this sense, the study contributes to the literature by providing empirical evidence of how EfS is interpreted and enacted in a context characterized by limited curricular guidance and institutional support. This highlights the need for more structured professional development focusing on both the conceptual and practical dimensions of EfS, in order to support a shift from activity-based approaches to more holistic and integrated pedagogical practices. In addition, clearer curricular guidance and professional development programs may support more consistent implementation across ECEC settings (Alici & Sahin, 2023; Vikane & Høydalsvik, 2024). Strengthening access to educational materials and institutional support could further contribute to improving practice.

Despite its contributions, this study has certain limitations. The use of a convenience sampling strategy limits the generalizability of the findings (Etikan et al., 2016; Golzar et al., 2022); the reliance on self-reported data may reflect participants' perceptions rather than actual practices (Creswell & Creswell, 2017). Future research could adopt mixed methods approaches, incorporating qualitative data such as interviews or classroom observations, in order to provide a more in-depth understanding of how EfS is enacted in practice (Johnson & Christensen, 2024). Further research could also examine how factors such as professional training, teaching experience, and institutional context shape the implementation of EfS in Greece. Comparative studies may additionally provide useful insights into how different educational systems approach sustainability in ECEC (Güler Yıldız et al., 2021).

Overall, the findings suggest that while early childhood educators in Greece tend to express favourable views toward EfS, its implementation remains variable and shaped by contextual constraints. Addressing this gap requires not only motivated educators but also coherent policy frameworks, targeted professional development, and sustained institutional support (Davis et al., 2024; Engdahl & Furu, 2022). Strengthening these dimensions may

contribute to the more effective integration of Education for Sustainability within Greek early childhood education and care.

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