



International perspectives on incorporating climate change into forest school training programs

Moriya Netzer^{a,*}, Dafna Gan^b, Ofira Ayalon^a

^a School of Environmental Sciences, University of Haifa, Abba Hushi Blvd, Mount Carmel, Haifa, 3498838, Israel

^b The Department of Education and Psychology, Open University of Israel, University Road, Ra'anana, 4353701, Israel

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ABSTRACT

Background: Forest Schools (FS) offer a unique learning environment that directly exposes students to climate change (CC), making them an ideal platform for climate change education. However, CC topics are rarely integrated into FS curricula.

Aims: This study compares the perspectives of FS practitioner trainers from 14 countries on integrating CC into FS training programs, examining how socio-cultural contexts and regional climate impacts influence these perspectives.

Sample: The study involved 36 FS practitioner trainers from 14 different countries.

Methods: A qualitative approach was used, combining document analysis and semi-structured interviews with FS trainers. Trainers were asked to discuss their views on incorporating CC into FS training programs. Thematic analysis was conducted to identify key factors influencing trainers' attitudes and practices.

Results: Over half (55%) of trainers expressed reluctance to include CC topics, citing social, psychological, educational, and practical challenges. In contrast, 44% supported climate change education integration, emphasizing the responsibility to future generations and the potential educational benefits of FS. Both groups highlighted the importance of fostering sustainable behavior and cultivating a connection to nature as key goals of FS education.

Conclusions: The study underscores the challenges and opportunities associated with incorporating CC into FS training. It provides practical suggestions for integrating climate change education, leveraging FS's outdoor pedagogy, and addressing barriers to effective implementation.

1. Introduction

The increasing global awareness of climate change (CC) is mainly driven by social media and political discourse, and has heightened the need to empower future generations with the knowledge and tools to mitigate and adapt to CC (Gabric, 2023; Jacquet et al., 2014). Climate change education aims to provide essential knowledge, skills, and values to foster resilience and influence policy and planning (Monroe et al., 2019; UNESCO, 2024). As a "top-down" initiative driven by the international community, CC education focuses on equipping educators with CC knowledge while promoting global collaboration (Dawson et al., 2022; UNFCCC, 2016).

Educators often perceive CC education as overly complex for young children (ages 5–11), expressing concerns about anxiety and the need for developmentally appropriate educational resources (Beaver &

Borgerding, 2023; Ginsburg & Audley, 2020). Recently, there has been a call to actively involve educators in the discourse surrounding CC to foster greater teacher engagement and increase the likelihood of CC education implementation and adaptation to local contexts (Dawson et al., 2022; Li et al., 2021; Rousell & Cutter-Mackenzie-Knowles, 2020).

The forest school (FS) is an educational approach that promotes holistic child development through sustained engagement in natural environments (Waite et al., 2016). FS represents a promising platform for introducing early childhood CC education. Through outdoor experiences, children observe environmental changes firsthand and can nurture a sense of connectedness and agency in responding to climate-related challenges (Beaver & Borgerding, 2023; Boileau & Dabaja, 2020; Cudworth & Lumber, 2021; Harris, 2021). Core elements of FS pedagogy, such as child-led, experiential learning and collaborative problem-solving, closely align with the foundational principles of

* Corresponding author.

E-mail addresses: monetzer@gmail.com (M. Netzer), dafna.gan@gmail.com (D. Gan), ofira@sni.technion.ac.il (O. Ayalon).

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CC education (Dawson et al., 2022; Li et al., 2021; Monroe et al., 2019; Rousell & Cutter-Mackenzie-Knowles, 2020). However, despite its strengths, FS has not widely integrated CC topics into either FS practice or the training programs that prepare educators (Dabaja & Uysal, 2022; England et al., 2024).

In recent years, FS has gained global traction as a grassroots movement driven by parental demand for education emphasizing holistic development over academics (Dean, 2019; O'Brien, 2022). This growth gained momentum in the post-COVID-19 pandemic period, highlighting the physical and mental benefits of outdoor education (Dickson & Gray, 2022). The widespread appeal and growing visibility of FS present new opportunities to embed CC topics into early childhood education settings globally.

Beyond its pedagogical potential, FS can also contribute directly to climate action by reducing the carbon footprint, decreasing energy demand, and promoting resource conservation, in comparison to traditional indoor educational settings (mitigation). FS function as a form of green infrastructure (adaptation), helping to address extreme heat and air pollution (Dickson & Gray, 2022; Khafif, 2024; Mell & Clement, 2019). Additionally, the physical and mental health benefits associated with FS may reduce health-related costs, adding economic value to their ecological contributions (Cudworth & Lumber, 2021; Dabaja & Uysal, 2022).

FS trainers (hereafter referred to as "trainers") represent a particularly influential group capable of embedding CC education within FS settings. In countries such as the UK, Canada, and Australia, formal training is considered essential for conveying the philosophy, pedagogy, practical skills, and risk management associated with FS instruction (England et al., 2024; Mackinder, 2020). Trainers play a crucial role in shifting from standardized, top-down CC education directives to more localized and co-constructed pedagogical practices (Rousell & Cutter-Mackenzie-Knowles, 2020). This is particularly important given the diverse ecological and cultural settings in which FS programs are expanding. A culturally responsive training approach enables trainers to tailor CC education to local values, environmental conditions, and community needs (Leather, 2018; Mackinder, 2020).

Each trainer has the potential to shape the instructional approaches of their program participants, who, in turn, refine and implement these methods in their programs. This dynamic can foster a cumulative impact, extending the reach of CC education across multiple FS settings. Embedding CC content in FS training may also catalyze supportive policy development, further legitimizing FS as a strategic educational response to climate challenges.

This research explores and compares global trainers' perspectives on integrating CC topics into FS training, focusing on how socio-cultural attitudes and regional climate impacts shape their approaches. The following research questions were addressed.

1. What are trainers' perspectives regarding the incorporation of CC into training programs?
2. How do the trainers introduce CC topics within their training programs?

1.1. Global diffusion of FS

The FS approach, which originated in early childhood education in Denmark, was later introduced into the UK and has since expanded to regions such as North America and Australia, evolving into a global movement (Dean, 2019). It follows a learner-centered pedagogy that emphasizes autonomy, play, experiential learning, and supported risk-taking (Waite & Goodenough, 2018). It has been applied across a range of age groups, but is most geared toward children aged 2 to 7 (Waite et al., 2016).

Given that most training programs are designed with early childhood education in mind, the present research primarily focuses on this age

group. The terminology used to describe FS varies across contexts, with terms such as "nature preschool" in the US, "bush kinder" or "nature play programs" in Australia, and reflects regional adaptations (Dean, 2019). In this research, the term FS is used interchangeably to refer to varied models and names across global contexts.

The FS model encompasses a wide range of definitions, pedagogical approaches, and implementation durations, shaped by variations in geography, culture, and educational policy (Dean, 2019; Waite et al., 2016). The absence of standardized definitions or accreditation frameworks complicates efforts to quantify FS implementation globally. Current estimates report approximately 200 FS programs in the UK (FSA, 2019), 800 in the US (Natural Start Alliance, 2022), 200 in Australia (O'Brien, 2022), and over 2000 in Germany (England et al., 2024). Data from Scandinavia is less precise: Norway reported 356 FS settings in 2021 (Alme & Alvestad Reime, 2021), and informal sources estimate more than 500 in Denmark (Dean, 2019).

Despite global growth, FS models are often criticized for overlooking local cultural and ecological contexts, reinforcing calls for more locally responsive approaches (Leather, 2018; Mackinder, 2020; Monroe et al., 2019). Furthermore, in regions where FS is not publicly funded, socio-economic barriers may limit participation, raising concerns about equity and accessibility, and potentially reducing the relevance of FS-based education on pertinent issues such as CC (Garden, 2024; O'Brien, 2022).

1.2. Forest school training programs

Variation in FS programs is also manifested in the diversity of FS training programs, which vary widely in prerequisites, duration, assessment, philosophy, pedagogy, and the role of nature (Bentsen et al., 2018; Waite et al., 2016). In this study, a FS training program is defined as one with a structured curriculum and distinct duration, and certified by a recognized institution (e.g., the Forest School Association in the UK, Natural Start Alliance in the US, or nationally endorsed accreditation elsewhere). The following section highlights differences in FS training in Denmark, the UK, the US, and Australia. Training programs from countries with fewer than four interviewees for this research (Table 1) are not described, reflecting the limited availability of peer-reviewed literature for contextualization and the scope of this paper. Denmark, however, is included due to its recognition as the birthplace of FS education (Dean, 2019).

Denmark lacks standardized FS training, but certified teachers (pedagogues) can choose it as an elective. Courses focus on integrating subjects through outdoor, child-centered learning. While not centered on environmental education, some universities now include related content in their curricula (Bentsen et al., 2018). In the UK, Bridgewater College introduced FS education in 1993, aligning with government policies on nature deprivation (Waite et al., 2016). Initially, training was offered by private providers, but the formation of the Forest School Association (FSA) in 2012 led to standardized certification (Waite & Goodenough, 2018). Teacher certification is not required; to become a certified FS practitioner, individuals need to complete the Level 3 FS

Table 1
The number of trainers from each country.

Australia	Europe	New Zealand	UK	US	Other	Total
5	Czech 1 Denmark 1 Finland 2 Germany 1 Hungary 1 Poland 1 Spain 2 Switzerland 1	2	7	10	Chile 1 South Korea-1	
5	10	2	7	10	2	

N = 36

practitioner qualifications and first aid certification. The one-year, 180-h program covers FS philosophy, child development, planning, practical skills, and woodland ecology (FSA, 2019).

In the US, FS training programs focus on holistic child development and foster ecological identity, with some also addressing certification and marketing (Larimore, 2016; NAAEE, 2023). The FS trainers are not required to have a teaching certificate. Training formats range from brief workshops to year-long courses, offered through university programs with certificates or privately with independent accreditation (NAAEE, 2023). In Australia, FS training is delivered by state networks, private providers, and some UK-based programs, varying in length from workshops to year-long courses. An early childhood education qualification is typically required. Programs cover the Early Years Learning Framework, nature play pedagogy, education for sustainability, and First Nation perspectives (Hughes, 2020).

1.3. Incorporating CC in early childhood education

CC education aligns with the UN Sustainable Development Goal (SDG13), aiming to improve education and empower children to influence community action and policy (Ennes et al., 2021; UNESCO, 2017). It has expanded beyond scientific knowledge to include psychological, social, and ethical dimensions, emphasizing experiential, interdisciplinary, and participatory methods (Monroe et al., 2019; Rousell & Cutter-Mackenzie-Knowles, 2020). These approaches deepen understanding by engaging students in real-world climate challenges through hands-on, collaborative activities that foster problem-solving and critical thinking (Hemminki-Reijonen & Logadóttir, 2021; Liarakou & Kalafati, 2023; Rousell & Cutter-Mackenzie-Knowles, 2020).

Despite its importance, CC education remains limited in teacher training worldwide (Dawson et al., 2022; Leal Filho et al., 2021; Monroe et al., 2019; Olawumi et al., 2023). Even where national frameworks promote CC education, implementation within teacher-training institutions is often inconsistent. For example, South Africa provides a broad national framework for school-level CC education while allowing universities flexibility in designing teacher-training curricula, which can lead to uneven integration (Olawumi et al., 2023). Other countries, such as Australia, have embedded CC education in national curricula of Education for Sustainability, yet implementation in teacher training programs remains inconsistent (Davis & Davis, 2021). Typically, CC education is introduced through natural science or geography courses (Davis & Davis, 2021). As a result, future educators receive minimal preparation to address the complex environmental, social, and economic dimensions of CC (Hill & Dymont, 2016; Leal Filho et al., 2021; Li et al., 2021).

The lack of CC education integration is particularly pronounced in early childhood education, despite evidence that young children can engage with sustainability concepts in ways that provide a foundation for age-appropriate CC learning and action (Davis, 2014; Hughes, 2020). CC education is typically introduced at the elementary level, as seen in the UK and in some states in the USA, with relatively few initiatives targeting children aged 3 to 5 (Rousell & Cutter-Mackenzie-Knowles, 2020). One exception is Australia, where CC and sustainability concepts are embedded within the national Early Years Learning Framework for children from birth to five years (Davis & Davis, 2021).

Preschool teachers often view CC education as developmentally inappropriate, fearing it may cause hopelessness, while also facing barriers such as time constraints and limited family engagement (Ginsburg & Audley, 2020). Advocates argue that preschoolers should learn about CC, as they will be affected by it, and limited knowledge can lead to climate anxiety later in life (Beaver & Borgerding, 2023; Ginsburg & Audley, 2020). Research shows that young children are interested in environmental issues, know about the state of the earth, and have ideas for its protection (Engdahl, 2015).

Teaching CC to preschool children requires developmentally appropriate methodologies that simplify complex topics and cultivate

knowledge, empathy, and a proactive mindset to inspire action. Experiential learning, narrative-based teaching, artistic expression, and emotional engagement are particularly effective for this age group (Jacobson et al., 2017; Klim-Klimaszewska & Wieruszewska-Duraj, 2023). These methods help translate abstract concepts into tangible experiences (Klim-Klimaszewska & Wieruszewska-Duraj, 2023; Liarakou & Kalafati, 2023).

1.4. Climate change and forest school: exploring the potential for implementing CC education

By its very nature as an outdoor approach, FS is significantly affected by CC. Extreme weather events can disrupt activities and pose safety risks, affecting both children and staff (Fortington et al., 2022; Park et al., 2021). Despite these challenges, FS offers a valuable platform for delivering meaningful CC education. Compared to an indoor setting, the outdoor setting provides an opportunity for active participation in CC mitigation and adaptation. Through regular interaction with natural environments, children can observe ecological changes firsthand and connect abstract climate concepts to tangible elements of their daily experience (Dean, 2019; Ginsburg & Audley, 2020; Mackinder, 2020).

While FS falls within outdoor education (Dean, 2019), its child-led, play-based approach contrasts with the structured, adult-directed methods of many outdoor programs that more directly address CC through problem-solving and scientific inquiry (Fox & Thomas, 2023; Ginsburg & Audley, 2020). Both models face similar challenges, including limited climate content and the need to balance emotional sensitivity with educational urgency (Fox & Thomas, 2023).

FS educators often identify nature connection as a key pedagogical bridge between FS and CC education (Beaver & Borgerding, 2023; Ginsburg & Audley, 2020). Nature connection is defined as a multidimensional construct that encompasses emotional attachment, cognitive awareness of human-nature interdependence, and a sense of belonging and responsibility (Nisbet et al., 2009; Reed, 2025). One way to cultivate a connection with nature is through meaningful experiences in nature (Chawla, 2020). Many FS educators prioritize nature connection over direct CC instruction in early childhood, due to concerns about emotional overwhelm and developmental readiness (Ginsburg & Audley, 2020). This approach is seen not as avoidance, but as a developmentally appropriate, long-term strategy to foster pro-environmental values and responsibility through positive early experiences in nature (Chawla, 2020; Ginsburg & Audley, 2020).

The FS approach incorporates several pedagogical strategies that align with effective CC education for early childhood. Among the four methods often identified as suitable for preschool CC education (i.e., experiential learning, narrative-based teaching, emotional engagement, and artistic expression), FS integrates the first three extensively and also supports artistic expression (Beaver & Borgerding, 2023; Klim-Klimaszewska & Wieruszewska-Duraj, 2023).

Experiential learning is central to FS pedagogy, encouraging children to engage directly with environmental challenges through hands-on exploration. Activities such as designing rainwater collection systems, investigating natural water flow, or experimenting with composting introduce children to core ecological concepts and foster an understanding of resource conservation and environmental processes (Beaver & Borgerding, 2023; Ginsburg & Audley, 2020). These practices nurture critical thinking, creativity, and a sense of agency in addressing climate-related issues (Cutter-Mackenzie & Rousell, 2019; Reinert, 2021). Narrative-based teaching in FS draws on imaginative storytelling to link environmental issues to personal experiences and local contexts, helping children relate to abstract concepts in a meaningful way (Beaver & Borgerding, 2023; Ginsburg & Audley, 2020).

In addition, the consistent return to the same natural environment supports emotional engagement by fostering familiarity, reducing fear, and cultivating empathy, responsibility, and a sense of place. These emotional bonds encourage children to see themselves as capable of

contributing to environmental change (Harris, 2021). The FS approach also fosters creative and artistic engagement by inviting children to carve, build, and craft using natural materials found in the environment (Leather, 2018).

Moreover, FS environments themselves function as living models of climate resilience. The absence of energy-intensive infrastructure demonstrates low-impact living, while vegetation and soil features help mitigate urban heat and manage stormwater runoff (Dickson & Gray, 2022). These embedded practices offer concrete, observable examples of adaptation and mitigation, reinforcing the message that even small actions can contribute to positive environmental change (Bentsen et al., 2018; Boileau & Dabaja, 2020).

2. Methods

2.1. Methodology

This research used a qualitative multiple-case study method, analyzing data from interviews with trainers from fourteen countries alongside information drawn from the websites of the corresponding training programs represented in the sample. This approach captures the complexity and diversity of cross-cultural contexts (Stake, 2013). Semi-structured in-depth interviews with trainers were utilized to ensure a thorough exploration of the topics while allowing for flexibility (Gustafsson, 2017). The interview comprised seven questions (Appendix A) aimed at eliciting insights into the trainers' experiences and perceptions about FS, perspectives on the relationship between FS and CC, and views on integrating CC into the training program. The questions were designed through consultation with FS educators and environmental education experts. Data from eighteen training websites provided information on training duration, prerequisites, type of certification, curriculum details in general, and for CC education in particular, objectives, pedagogical methods, and assessment methods. These websites were associated with trainers who participated in the study; not all interviewed trainers had an active website, and no additional websites were selected beyond the interview sample. The document analysis provided additional insights and validated findings through triangulation.

The study was approved by the University's ethics committee (reference number 428/21). The trainers provided informed consent; their identities were anonymized to ensure confidentiality and privacy.

2.2. Participants

The research sample included thirty-six trainers (Table 1): thirty-one served as directors of FS training programs, two as co-directors, and three as university-based FS education experts who, in addition to their academic roles, actively teach in FS certification courses at their institutions. Among the program directors and co-directors, twenty-five were from private programs, while six were affiliated with colleges or universities offering FS qualifications. The programs train educators for early childhood and elementary education levels. Details of the training programs and their websites are provided in Appendix B1.

The sample comprised twenty-four females and twelve males. Nineteen trainers had backgrounds in environmental studies, seventeen had educational backgrounds, and one had a business degree. Twelve trainers had up to ten years of experience in FS training, fourteen had 11–20 years, and ten had over twenty years of experience. Comprehensive participant profiles are provided in Appendix B2.

2.3. Procedure and data analysis

Participant recruitment occurred in two stages. The initial outreach was conducted via FS training program websites. In the US, contact was made with training programs officially listed by the Natural Start Alliance. In UK, outreach was conducted with endorsed FS trainers listed on

the Forest School Association's official website. In other countries, individuals were affiliated with national FS organizations. In the second stage, additional trainers were acquired through snowball sampling, whereby initial trainers referred other relevant individuals from their professional networks (Noy, 2008)

The document analysis from the websites employed a deductive approach (Fereday & Muir-Cochrane, 2006), using predefined codes to analyze FS programs, including objectives, pedagogical methods, and curricula (Waite et al., 2016). In addition, author-defined codes were created for technical aspects such as training duration, prerequisites, type of certification, and the explicit inclusion of CC. These dimensions were compared across websites, allowing us to identify structural and contextual variation in FS training provision before conducting the interviews. Interview questions, initially developed with FS and environmental education experts, were refined using website data to clarify key areas.

The interviews, conducted by Author 1, took place between November 2023 and March 2024. Utilizing Zoom, audio-recorded sessions lasted between 40 and 70 min. Audio recordings were transcribed using Otter AI transcription software. Transcripts were coded iteratively using ATLAS.ti software, allowing systematic coding, textual access, and diverse data analysis, including numerical assignments (Busetto et al., 2020). A systematic inductive coding method (Fereday & Muir-Cochrane, 2006) was used to explore trainers' perspectives on integrating CC into training programs and their strategies. First-cycle coding of the interview data and the initial grouping of codes into broader conceptual categories were conducted by Author 1, a researcher in environmental education. In the second cycle, these categories were further refined, and potential relationships among them were identified. To enhance analytical rigor, this stage was independently replicated by Author 2, a researcher in environmental education who also teaches in an academic FS certification program. The resulting categories were then collaboratively reviewed and discussed by both authors to develop overarching themes (Saldaña, 2013). Website data were cross-referenced with interview responses to identify consistencies and discrepancies between stated curricula and trainers' reported practices, enhancing the credibility and depth of the findings. Appendix C indicates which code originated from document analysis and which originated from interview data.

Descriptive quantification of whether CC is integrated into the training program was used to support and structure the thematic interpretation of the data, rather than to make statistical inferences. The interviews were coded based on whether trainers "incorporate" or "do not incorporate" CC education within their training programs. These categorical codes were then aggregated, and their frequencies calculated to identify recurring patterns across the dataset. This form of supplementary counting adds a descriptive quantitative dimension to the qualitative analysis. It serves to enhance the transparency, structure, and interpretive clarity of the findings by indicating the relative prominence of particular themes within the sample, without suggesting statistical inference or generalizability beyond the study context (Hannah & Lautsch, 2011).

3. Results and discussion

3.1. Climate change as a personal-educational mandate: integrating CC education into FS

Most trainers (n = 34) view CC as a critical issue, with some describing it as the "most significant crisis we are facing" (Interview 5, Chile). However, two trainers articulated alternative perspectives, viewing CC as a manageable or even beneficial shift across FS practice with both children and trainees: "[CC] is not [a] good situation, but I treat it as an opportunity in my work ... I now have a new area to work because places [that] used to be swampy ... now they're dry" (Interview 15, Poland). Trainers' knowledge and beliefs about CC affect both the

time they spend on it and how they present the content (Hannah & Rhubart, 2020).

Despite the widespread recognition of CC as urgent, curricular incorporation remains limited. Only three training programs (two from Europe and one from the US) explicitly incorporate the term CC in their website or link sustainable practices to mitigation or adaptation strategies. For example, although Training Program 18 (Spain, Appendix B2) does not incorporate CC topics directly, it comprises nine units in which environmentally related themes are interspersed. These include topics such as “Nature Connection for Personal and Professional Development” and “The Human Role in a Healthy Landscape,” which emphasize nature connection and environmental stewardship. However, the explicit term “CC” was absent from the curriculum.

Interview data, however, revealed a more complex picture. While most trainers acknowledged the gravity of CC, their actual approaches to incorporating CC within FS trainer education varied considerably. Of the 36 interviewees, 16 trainers supported integrating CC into their training programs, while 20 trainers opposed it. This discrepancy between expressed beliefs and enacted practices is well-documented in CC education literature (Hannah & Rhubart, 2020; Seroussi et al., 2019).

Several trainers described a responsibility to equip FS trainees with the skills and mindset needed to address CC constructively. One trainer shared: “We are talking about building resilience in kids ... you have to talk about CC [in training program] ... We are responsible for building that idea of wonder ... capability ... problem-solving and giving trainers a sense of positivity around those skills (Interview 14, New Zealand).” This perspective frames CC education to build agency and resilience in FS training program participants, preparing them to approach the topic with confidence and hope in their future work with children.

By framing CC challenges as opportunities for proactive engagement, trainers support program participants in developing the confidence and pedagogical strategies needed to teach CC in ways that foster constructive and resilience-oriented responses among their future students. This approach may help reduce climate-related anxiety among program participants, a factor identified as a significant barrier to the effective incorporation of CC education in practice (Monroe et al., 2019; Stevenson et al., 2017). To further clarify the perspectives of trainers, the next section outlines reasons cited by those who oppose CC topics in training, followed by arguments from those in favor. Fig. 1 visually represents these positions by mapping the thematic codes and categories that emerged from the interview data.

3.2. Opponents’ barriers to integrating CC education

3.2.1. Social and psychological concerns

Social and psychological concerns emerged as key barriers discouraging FS trainers from integrating CC content into their training programs. Personal views on CC are influenced by cultural norms, political climate, and media coverage (Nossek, 2019). Trainers perceive CC as a ‘controversial’ and ‘political issue’ and express concern that discussing it might provoke anxiety for themselves and for the participants in their training programs, as explained by a trainer with fourteen years’ experience: “The amount of emotion it [CC] brings ... I don’t want to deal with climate grief in the training program” (Interview 24, UK). This perception arises both in contexts where CC is politicized, such as Australia (Falkenberg et al., 2022), and in contexts such as the US, where public discourse on CC is polarized and uneven across regions (Averchenkova et al., 2021; Smith et al., 2024), suggesting that broader societal influences shape trainers’ reluctance (Zilliacus & Wolff, 2021).

A second barrier involved concerns about the emotional impact of CC on young children. Trainers, particularly from the US and Europe, questioned whether children possess cognitive maturity to process such complex issues, fearing negative emotional consequences. One US trainer shared, “We should not be putting the weight of environmental issues that are adult problems to solve when all it does is create anxiety and a sense of hopelessness” (Interview 27, US). These perceptions of children’s emotional readiness directly shaped trainers’ decisions about what content is appropriate to include in FS trainer education. Because many trainers did not clearly distinguish between addressing CC with children and addressing it within adult training programs, these concerns often led to the exclusion of CC from training altogether.

It may be inferred from the interview data that trainers’ reluctance to incorporate CC education into their programs is linked, at least in part, to the lack of professional development on how to address CC within FS settings when training future FS teachers. As one trainer explained, “I don’t have any specific CC content to teach ... CC topics are certainly something you could introduce into the outdoor learning program ... or natural science, but not [in FS]” (Interview 26, Spain). This highlights a perceived disconnect between FS and climate-related instruction, revealing underlying uncertainty about how to approach the topic pedagogically within the framework of trainer education.

This uncertainty includes concerns that addressing CC in training may prompt participants to apply it in practice in ways trainers feel unprepared to support. As one trainer explained, “They [the participants] said, we don’t know how to address it ... we [trainers] don’t

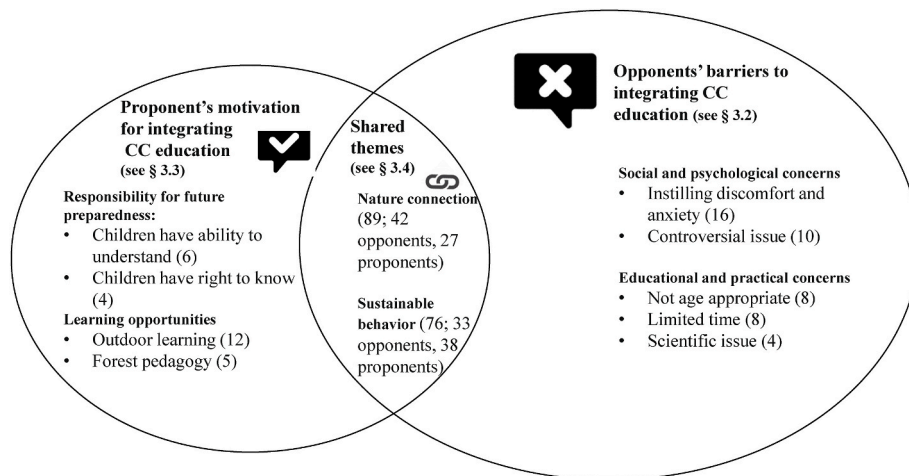


Fig. 1. Thematic codes and categories cited by FS trainers who either support (left circle) or oppose (right circle) the inclusion of climate change (CC) content in training programs. Shared themes that appear in both groups are marked with a linking symbol (). The size of each circle corresponds to the number of codes associated with that theme. Frequencies of individual codes are noted in parentheses.

want to scare people [talking about CC], but we do need to educate people ... we don't know how to address it" (Interview 33, UK). Both trainers and participants share uncertainty, not about the importance of CC education, but about how to teach it effectively.

This reluctance reflects a broader uncertainty about how to teach CC in developmentally appropriate and emotionally constructive ways (Ginsburg & Audley, 2020; Li et al., 2021). While FS pedagogy offers opportunities to frame CC as empowering rather than fear-inducing (Beaver & Borgerding, 2023), trainers appeared unaware of how to leverage this pedagogical potential within their programs.

Low self-efficacy emerged as a third barrier, with several trainers, despite their experience, doubting their impact on CC outcomes, a perception that shaped how they approached CC within trainer education and, in turn, influenced participants' preparedness to support children's climate-related learning. One trainer explained, "There are bigger forces driving CC than anything a preschool teacher in the woods with young children can influence" (Interview 32, US). Ambiguous framing of CC education, particularly regarding its relevance for early childhood training programs, conveys an indirect message that undermines its perceived value and appropriateness within FS practice. This may reduce participants' self-efficacy and discourage meaningful engagement, ultimately limiting its impact on children (Li et al., 2021).

3.2.2. Educational and practical concerns

Trainers frequently framed CC as developmentally inappropriate for young children, particularly due to its abstract and long-term nature: "In the theory of the development, the concept of time and change for the children before ... nine years, it is not something they understand ... you have to talk and to teach about CC when it is possible for the child to understand" (Interview 19, Switzerland). These beliefs informed trainers' decisions about what content is appropriate to include when training future FS leaders. As one trainer explained: "When I talk about CC, they [trainers] think it's too obstructive for children ... there are other organizations, NGOs, who know how to teach about CC" (Interview 15, Poland). This reflects a tendency to position CC education outside the remit of FS trainer education, rather than adapting it within FS pedagogical frameworks.

Interview data further revealed that many FS trainers entered the profession, incidentally, developing their practice through personal experience or self-guided learning, such as online resources, rather than through formalized professional development. In the absence of standardized qualifications or a structured curriculum for FS trainer education, most have not received explicit guidance on how to integrate CC into training. As a result, trainers possess general FS expertise but lack the pedagogical strategies necessary to support program participants in addressing CC effectively and developmentally. Educators require both content knowledge and content-specific teaching strategies, particularly when tackling complex issues such as CC.

CC is often perceived as a scientific issue: "Climate change is science, it is in mainstream schools, [that is the reason] I am thinking don't worry about teaching that [in the training program]" (Interview 26, UK). CC topics are integrated into the national curriculum across various countries, typically within science and geography (Dawson et al., 2022). In some European countries and the UK, FS programs are often delivered as part of school programs for a few hours or a day each week (Waite & Goodenough, 2018). As a result, trainers often exclude CC topics from their training programs and focus on preparing trainees for skills not covered in traditional schooling. This is especially the case in programs linked to bachelor's or master's degrees with mandatory CC courses (See Appendix B2, training programs 19-Switzerland, and 20-UK).

The perception that CC is too complicated to teach, coupled with limited pedagogical resources, leads trainers to deprioritize CC content in their programs: "That's such a complicated topic to address, I have a finite amount [of time] to teach my course that I do not want to get distracted" (Interview 24, UK). Similar constraints are reported across

the wider teaching community (Li et al., 2021; Stevenson et al., 2017).

3.3. Proponent's motivation for integrating CC education

3.3.1. Responsibility for future preparedness

Proponents of CC in training programs felt a responsibility to prepare adult participants for their role in shaping the responses of future generations to CC. As one trainer explained:

In the training program, I talk about CC ... because I want people to have a context and a basis for its vital importance. I talk about 'my why', which is absolutely about CC ... our temperature has gone up ... then the flooding and the huge events ... big storms ... really big change (Interview 35, US).

This quote reflects the trainer's emphasis on grounding CC education in personal motivation and inspires a sense of urgency and responsibility among program participants.

This perspective, more prevalent in Australia and New Zealand, stems from the belief that educators must be equipped to address topics that deeply affect children's futures. As one trainer stated: "The UN rights of the child say children have a right to have a say on matters that are going to impact their futures. And at the moment, there's nothing greater than CC" (Interview 4, Australia). According to this view, FS training programs serve as a crucial space for preparing future educators to support children's engagement with CC in developmentally appropriate and empowering ways. Equipping educators with the knowledge to prepare future generations for CC is particularly important in FS training programs, given the diverse backgrounds of FS teachers, many of whom do not come from environmental fields and have varying motivations for entering the field (Kemp, 2020; Waite & Goodenough, 2018).

Proponents acknowledged that CC may evoke anxiety but argued that avoiding the topic in training programs is not professionally appropriate. Given the unavoidable presence of CC in daily life and the media, educators must be supported in navigating it thoughtfully. FS training, therefore, is seen to equip participants with strategies to guide children toward resilience rather than fear. As noted by one trainer: "There is ... a real understanding that climate anxiety is huge ... one of the very best ways to mitigate climate anxiety is to teach children that nature does know what it's doing. Nature has the answers ... people can learn [from nature]" (Interview 21, UK). Trainers emphasized that modeling emotionally constructive approaches to CC within training is essential for preparing participants to address the topic in their future practice with children.

This approach aligns with the belief that FS pedagogy can serve as a foundation for preparing educators to foster hope, agency, and resilience. In training settings, this requires not only delivering CC content but also modeling affective pedagogical practices that mitigate fear and support thoughtful engagement with climate issues (Chawla, 2020; Ginsburg & Audley, 2020; Rousell & Cutter-Mackenzie-Knowles, 2020).

3.3.2. Learning opportunities

Outdoor settings provide opportunities to observe weather and biodiversity changes. Although the duration of most training programs is typically insufficient for participants to witness long-term transformations, trainers focus on equipping them with the skills and strategies necessary for identifying and interpreting such changes independently in their future practice. Proponents of incorporating CC into FS training teach participants how to notice and analyze these changes, as one trainer noted: "I teach to raise awareness to all the little nuances that come with CC ... to be able to experience those and to observe them. And then if something ... pulls on that string of CC, you can see the reverberations" (Interview 34, US). By embedding these practices in training, CC can be addressed in ways that are contextually grounded and developmentally appropriate (Beaver & Borgerding, 2023; Li et al., 2021).

3.4. Nature connection and sustainable behavior in FS training: shared themes, divergent logics

The theme of “nature connection” emerged as a central strategy among trainers preparing FS participants to engage with CC education, often articulated through affective language such as a “love for nature.” This perspective was shared by 23 trainers overall, including 16 of the 20 opponents and 7 of the 16 proponents. Among opponents, nature connection was framed as an indirect route to stewardship: “It’s about being out in nature and learning to love it ... so that when they grow [they will] become the future guardians” (Interview 13, New Zealand). This child-focused rationale informed how trainers designed their training programs, leading them to prioritize cultivating nature connection among adult participants as a sufficient foundation for future environmental responsibility.

However, proponents for integrating CC into the training program criticize this assertion, arguing that merely facilitating this connection to nature is insufficient: “A lot of educators have hung on to that quote you ‘can’t care for nature unless you love it’ ... children may not want to care and protect nature just because they’ve been playing in nature” (Interview 4, Australia). From this perspective, nature connection, while valuable, must be accompanied by intentional CC pedagogy that equips FS trainees with the skills to engage critically with environmental issues.

Sustainable behavior was a common theme among both proponents (7 of 16) and opponents (5 of 20) of integrating CC into training. Among opponents, CC was typically embedded within broader sustainability content rather than addressed explicitly, as one trainer noted: “We don’t ... talk about CC as a specific [subject] ... it sits within the module of ‘sustainable management’ of the space ... we asked them to do an impact assessment ... I’m very conscious of forcing [CC] into people” (Interview 22, UK).

This illustrates a preference for incorporating CC within broader sustainability modules, favoring it over directly discussing its causes and effects, allowing program participants the autonomy to decide whether and how to address the topic in their practice. This approach was also noted by a US trainer: “[I’m] teaching that humans need to be sustainable ... I don’t know if teaching about CC in our capacity is all that useful” (Interview 32). This perspective suggests that some trainers perceive FS training programs as not fully equipped to engage with the complexities of CC, leading them to prioritize tangible, practice-oriented sustainability actions.

Proponents of integrating CC argue that teaching and practicing sustainable behaviors alone are insufficient within the training program. They emphasize the need for discussions that link these actions to CC: “Some of the ... educators might just walk past them [sustainable action] and not really connect between sustainability and CC” (Interview 4, Australia). For example, three trainers described asking participants to carry water to sites without running water as a practical exercise in resource conservation and sustainable behavior.

When people come to FS training ... some of them have never thought about these things, particularly [connecting between sustainable behavior and CC]. They’ve not thought that’s part of their role. With FS ... you’re thinking about how we use resources like carrying our water into the woods ... and linked into the Sustainable Development Goals or CC. (Interview 21, UK)

Though simple, such activities can prompt discussions in training about climate-related resource challenges such as water scarcity. Framing them within a CC context helps prepare participants to link sustainability practices to climate mitigation (Ginsburg & Audley, 2020).

3.5. Forest schools: opportunities for mitigation and adaptation

Only four trainers acknowledged the potential of FS to address CC beyond education, emphasizing its role in mitigation and adaptation efforts. These trainers framed FS not only as a pedagogical approach but also as a low-impact alternative to conventional educational infrastructure, with implications for energy use and resource consumption. This perspective is illustrated by one trainer:

I was talking with an architect [about FS] and said, ‘do you understand what this means for CC?’ ... [we] don’t need this kind of level of heating and cooling ... and [we] are not using tons of the earth’s resources (Interview 34, US).

Of these four, only three explicitly discussed this potential with participants in their programs:

The aim is to make some effects on the CC by propagating the importance of the forest ... this is about mitigation but also adaptation ... if we promote the role of FS then it helps to convince people that there should be more and more forests in the country (Interview 11, Hungary).

By emphasizing how FS can contribute to CC mitigation and adaptation, trainers encourage participants to see themselves as educators whose work carries ecological significance and has the potential to influence climate-related policy debates.

3.6. Integrating CC education into FS training programs: pedagogical strategies

Trainers advocating for the integration of CC into their training programs employ various tools and strategies that are part of FS pedagogy. While some of these strategies explicitly reference CC, many are framed more generally to align with FS principles and avoid controversy when working with young children. Most address CC topics indirectly, using less controversial approaches suited to early childhood education. As one trainer explained when describing how FS training prepares participants to work with children:

[talking about CC] often feel sad, what’s brilliant about the FS is ... [we] have these tools to go back into children’s worlds and bring joy ... to build skills. So, they are proactive in their local spaces ... they feel empowered because they can do something in their place with the children. (Interview 26, UK)

Rather than dismissing emotional concerns, FS training programs aim to equip educators with emotionally responsive, action-oriented strategies designed to support young learners in developmentally appropriate ways. Table 2 outlines the strategies emphasized in training, including descriptions, illustrative examples, alignment with FS and CC education principles, and whether they are explicitly framed as CC within FS training contexts.

3.7. Summary of results

Based on data from training program websites, only three programs explicitly mentioned CC in their descriptions. However, interviews with trainers revealed that 16 of the training programs integrated CC topics mostly indirectly. Fig. 2 demonstrates the number of opponents and proponents for each country.

The integration of CC into training programs varies across regions and often uses indirect methods (Table 2). Tracking biotic and abiotic changes is common in all countries. Project-based approaches are also widely used, though less frequently in Europe. In Europe, collaboration with forest services is prominent, while in the South Pacific and the US, indigenous knowledge, eco-storytelling, and role-play are more common.

These regional variations are not merely contextual; they shape the

Table 2
Strategies for explicit CC education in the training programs.

Strategy	Description	Example quote	FS principle/ skills	CC education strategy	Direct/ Indirect	Countries where this strategy is referenced	No. of FS trainers identifying this strategy
Eco-story telling	Teach participants how to develop and use narratives that convey environmental concepts to children, highlighting human-nature interactions or relationships between organisms within the FS setting to empower children by illustrating their potential contributions to CC solutions	We do [talk about CC] when it comes to storytelling. The early childhood teachers ... learn to write stories about ... concepts that a two and three-year-old needs to think and wonder about (Interview 2, Australia)	Storytelling, imagination	Creativity	Indirect	Australia New Zealand	3
Indigenous Knowledge	Teach participants how to engage with an Indigenous worldview centered on the post-humanist integration of social, ecological, and spiritual relationships	One thing that's popular in the US... is the 'Leave No Trace' principle. That's one area that we don't incorporate as much as people would think that we do. We focus on more of the Indigenous understanding of reciprocity. We teach [in the training program] ... about which plants you harvest, or which plants you observe (Interview 39, US)	Connection between the learner and the natural world	Locally grounded approaches	Indirect	Australia New Zealand US	6
Keeping track of biotic and abiotic changes	Teaching participants techniques to monitor changes in biotic and abiotic components in natural environments	Teaching the children to be observant is a good way of being brought up in terms of CC ... it's the start of a lifelong exposure that then allows you to notice those changes and be observant enough to and care enough to do something about it (Interview 29, UK)	Observation	Scientific knowledge	Indirect	Australia, Finland Germany Hungary New Zealand Spain UK US	13
Role-play	Teaching participants to use role-play activities such as having children embody animals or plants, as a method for helping young learners explore the impacts of CC in a relatable and tangible manner	[we teach] how to invite [the children] to become animals ... and talk about the issues For example, if I'm an owl and have big issues because people are changing the forest, I don't have where to live now (Interview 5, Chile)	Creativity	Creativity	Indirect	Australia Chile New Zealand US	6
Project approach	Teaching participants to design hands-on projects of real-world problems that address real-world environmental challenges, with an emphasis on exploring human-nature relationships as a foundation for CC education.	It's about having a question and then children and educators researching together ... then coming to some resolution ... we need to engage with children in taking action as well (Interview 4, Australia)	Experimental and hands-on learning	Experimental and hands-on learning, participatory	Indirect	Australia New Zealand Spain UK US	8
Collaboration with the Forest Service	Instructing participants to collaborate with foresters on forestry aspects related to CC	CC is a topic ... in the module called 'forest basics' ... basic forest knowledge ... how we can adapt our forest to CC (Interview 10, Germany)	Social interaction	Scientific knowledge and skills to engage in CC mitigation and adaptation	Direct	Germany Hungary UK	3

effectiveness of CC education by aligning strategies with local values, educational structures, and environmental settings. For example, in Australia and the US, the integration of indigenous perspectives embeds CC education within culturally meaningful narratives of reciprocity and sustainability. In European programs, particularly in Germany and Hungary, FS training often takes place in natural forest environments and involves collaboration with forest services, while in the South Pacific and North America, training is more commonly conducted in managed green spaces rather than in wild or natural forests.

4. General discussion and conclusions

This research contributes to the theoretical understanding of how CC education can be conceptualized and enacted within the FS framework, offering new insights into an area that has received limited attention in

existing literature. Trainers hold the potential to equip program participants with the tools and strategies needed to implement CC education effectively in the FS framework. Trainers' perspectives reflect a strong sense of responsibility to address CC yet also reveal uncertainty and ambivalence about how to integrate it effectively into their training programs. They face a range of challenges shaped by both external and internal factors. Externally, policies and media narratives often portray CC as a complex, controversial issue, creating barriers to its inclusion even with adult participants. Internally, psychological concerns, such as the potential to induce anxiety in trainers, program participants, and children, further constrain efforts to incorporate CC education. These challenges align with findings in broader CC education research, where educators express concerns about the emotional and cognitive burdens of teaching CC to young learners (Ginsburg & Audley, 2020; Hemmin-Ki-Reijonen & Logadóttir, 2021; Li et al., 2021).

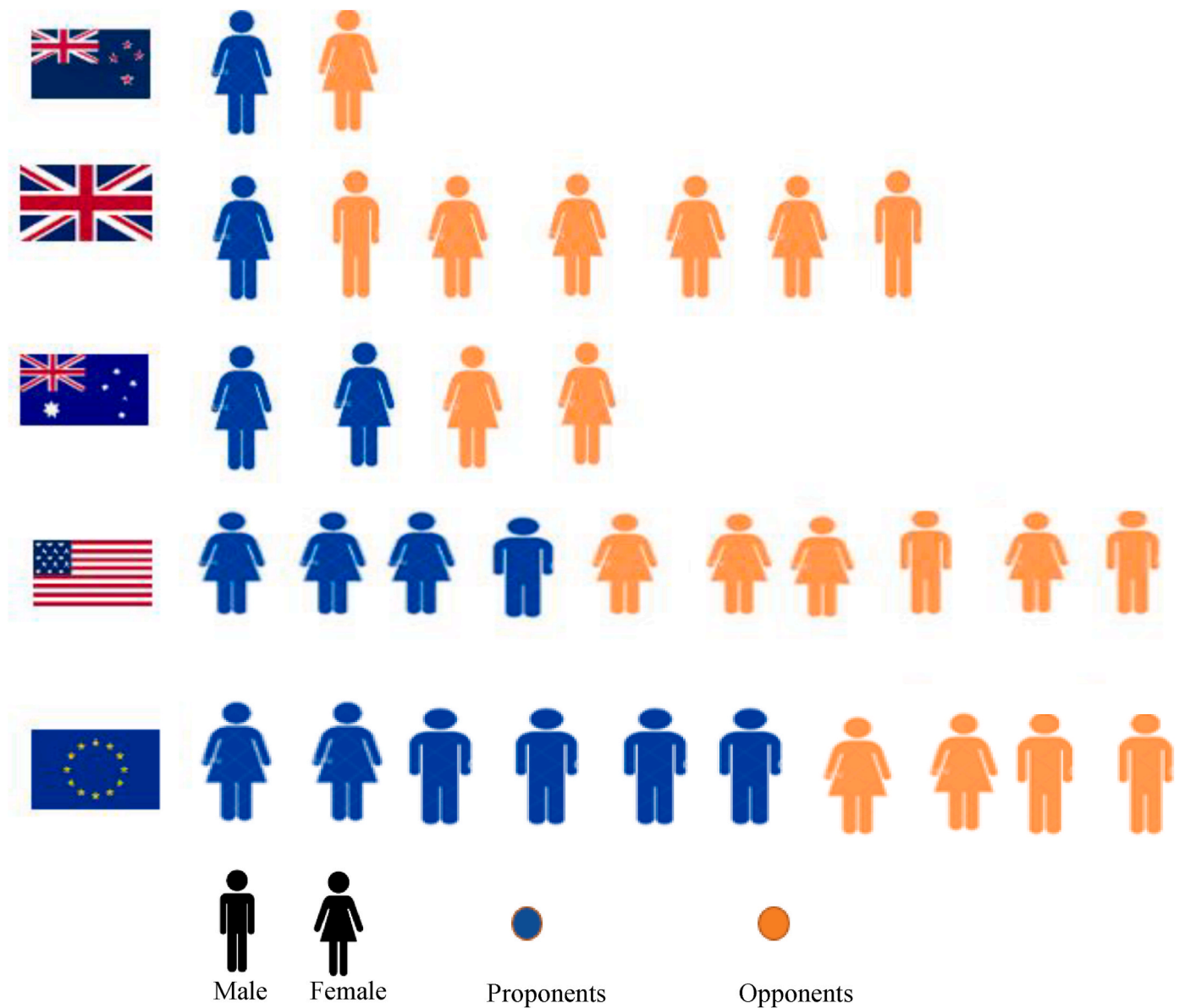


Fig. 2. The number of trainers by country proponents and opponents of integrating CC
 * Countries outside Europe with only one program in the study were excluded from the figure.

Internal and external concerns are often amplified by cognitive biases such as motivated skepticism, the tendency to scrutinize threatening or dissonant information more critically (Jacquet et al., 2014). These biases may lead trainers to focus on emotional risks while overlooking the potential benefits of early CC engagement for children, including the development of resilience and agency (Ginsburg & Audley, 2020; Jacquet et al., 2014). Such tendencies highlight the need for strategies that strengthen trainer confidence and shift perceptions. As program participants are adult educators, engaging them in structured dialogue offers a valuable opportunity to co-develop context-sensitive strategies for integrating CC education into the FS environments in which they will eventually work. This study makes a practical contribution by providing a foundation for such dialogues, offering empirical insights into trainers’ perspectives and barriers, and informing the development of more responsive and grounded approaches to CC education in FS settings.

Another barrier to the inclusion of CC education is the lack of adequate preparation among trainers. In many countries, CC is not explicitly addressed within early childhood education programs and

remains largely confined to secondary-level science or geography curricula (Davis & Davis, 2021; Leal Filho et al., 2021). Within our sample, more opponents had an educational background (n = 12) than an environmental background (n = 8), potentially contributing to limited content knowledge and lower pedagogical confidence in addressing climate topics. This knowledge gap can lead to missed opportunities for introducing CC content in emotionally appropriate and pedagogically sound ways (Ginsburg & Audley, 2020).

Despite these challenges, the study highlights practices from FS trainers who integrate CC education. By using developmentally appropriate and empowering strategies, they help frame environmental issues as manageable, offering practical insights for informing future training design (Chawla, 2020; Rousell & Cutter-Mackenzie-Knowles, 2020). The training programs also provide opportunities to demonstrate how FS strategies can effectively incorporate CC content in accordance with recommended CC education principles for young children, as illustrated in Fig. 3.

A conceptual framework illustrating how FS strategies support developmentally appropriate CC education for early childhood. The

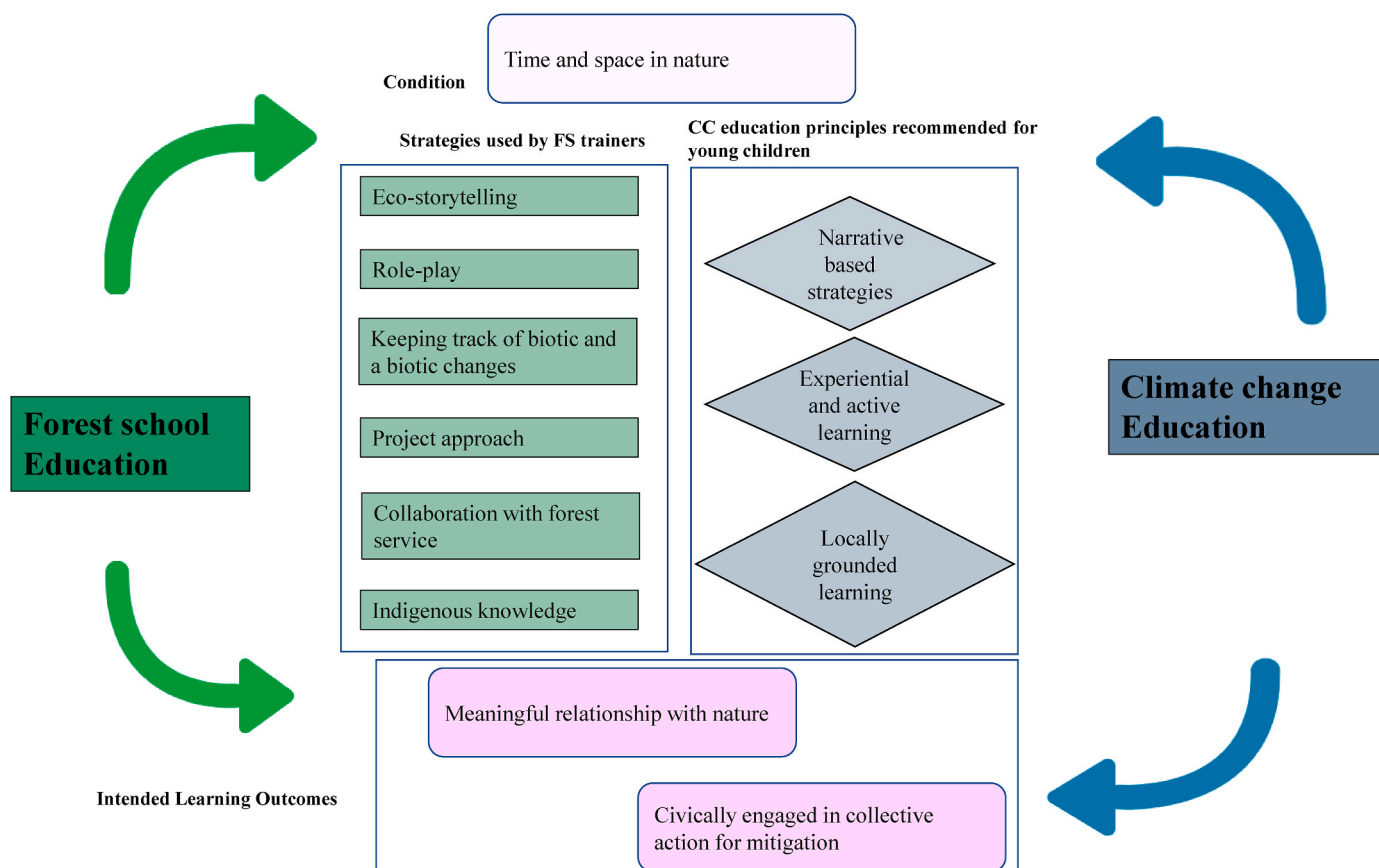


Fig. 3. Integration of FS strategies for effective CC education.

figure highlights specific pedagogical methods proposed by FS trainers and links them to core CC education strategies (adapted from Klim-Klimaszewska & Wieruszewska-Duraj, 2023; Liarakou & Kalafati, 2023; Rousell & Cutter-Mackenzie-Knowles, 2020) and their intended learning outcomes.

In FS training programs, time spent regularly in nature is leveraged to model how locally grounded learning can make CC education more relevant and accessible. By drawing on local ecological and cultural contexts, trainers demonstrate how CC can be reframed in tangible ways (Beaver & Borgerding, 2023). Participants are introduced to active learning strategies, such as monitoring environmental changes and engaging with local issues, to support the simplification of complex CC concepts (Hughes, 2020; Rousell & Cutter-Mackenzie-Knowles, 2020).

Narrative-based tools such as storytelling and role-play are valued not only for fostering creativity and problem-solving, but also for supporting children in processing emotional responses to environmental issues (Monroe et al., 2019). These tools are particularly valuable, as prolonged outdoor exposure may evoke anxiety in children witnessing ecological degradation (Chawla, 2020). Trainers are encouraged to equip participants with expressive methods for supporting children's emotional coping (Rousell & Cutter-Mackenzie-Knowles, 2020). FS training includes discussion of community-based activities such as habitat restoration and sustainable practices (Hughes, 2020); however, these are rarely framed within the context of broader climate mitigation efforts (Beaver & Borgerding, 2023). Training programs can strengthen this connection and position FS as a site for both mitigation and adaptation. Making this link explicit may enhance participants' self-efficacy by providing meaningful, action-oriented experiences that reinforce their role as environmental educators (Li et al., 2021).

The strategies outlined in Fig. 3 illustrate how FS training programs prepare future educators to deliver developmentally appropriate and context-sensitive CC education through approaches such as ecological

storytelling and role-play. To achieve broader and more sustained impact, however, these pedagogical innovations must be embedded within supportive policy environments that facilitate their institutionalization. By documenting current practices, challenges, and opportunities for integrating CC education within FS training, this research provides an empirical foundation to inform the formulation of policies that position FS not only as a relevant context for CC education, but also as a means of contributing to climate mitigation and adaptation.

Ensuring such policy impact requires FS training to be aligned with official educational objectives, institutional frameworks, and key implementation mechanisms, including curriculum development, regulatory standards, and funding allocation. Increased governmental support through policy mandates, targeted funding, and accreditation incentives could expand access to FS programs, encourage the establishment of new initiatives, and help overcome barriers to participation. This, in turn, would promote equitable access to quality education, aligning with United Nations Sustainable Development Goal 4: Quality Education (UNESCO, 2017), and justify greater investment in climate-related educational initiatives.

This research also highlights regional variation in the integration of CC education into FS training. Documenting these diverse approaches reveals context-specific adaptations and offers a foundation for cross-regional learning. Sharing such practices can inform policy development, support innovation in training design, and strengthen global networks, ultimately fostering cross-cultural understanding and more effective CC education at an international level (UNESCO, 2017).

This research has several limitations. The use of snowball sampling may have biased the participant pool toward individuals already embedded in professional networks, potentially excluding trainers with divergent views or limited engagement in climate discourse. Furthermore, as a qualitative study, the findings are inherently context-dependent and are intended for analytical transferability rather than

broad applicability, with relevance to contexts characterized by similar institutional, cultural, or pedagogical conditions. To address these limitations, future research could adopt a quantitative approach to include a broader and more diverse sample of FS training programs, thereby enhancing the scope of comparative analysis. In parallel, qualitative studies could deepen insights into trainers' beliefs and assumptions by using indirect elicitation techniques, such as hypothetical scenarios or reflective writing, which may reveal underlying attitudes not easily accessed through direct interviews (Porr et al., 2011).

Future studies could explore how FS trainers' perceptions evolve regarding the inclusion of CC education, particularly as they gain experience and confidence in integrating it into their practice. Longitudinal research could examine changes in attitudes, instructional strategies, and emotional responses over time, for example through interviews or reflective journals with trainers. Given that climate anxiety is frequently cited as a major concern deterring educators from teaching CC education, future research could also examine how children emotionally respond to climate-related content, using child-centered methodologies such as drawings, artwork, or narrative play (Rousell & Cutter-Mackenzie-Knowles, 2020).

This study makes both theoretical and practical contributions by examining how CC education is conceptualized and enacted within the FS framework, an area that has received limited attention in literature. It provides empirical insights into the perspectives, practices, and challenges experienced by FS trainers, offering guidance for strengthening training design, supporting teacher self-efficacy, and framing FS as a context for mitigation and adaptation.

CRedit authorship contribution statement

Moriya Netzer: Writing – original draft, Investigation, Formal analysis, Data curation, Conceptualization. **Dafna Gan:** Writing – review & editing, Supervision, Conceptualization. **Ofira Ayalon:** Writing – review & editing, Supervision, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work, the author(s) used ChatGPT (OpenAI, the version accessed on March 5, 2024) in order to support academic language editing, improve clarity and coherence, and assist with sentence restructuring. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.learninstruc.2026.102339>.

Data availability

Data will be made available on request.

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Moriya is a PhD student at the School of Social Sciences at Haifa University. This research examines the connection between forest schools and climate change, focusing on the perspectives and experiences of forest school teacher trainers. It addresses the challenges of integrating climate change content into teacher training and aims to inform policy development for forest schools. The study contributes to enhancing educator training programs, raising climate change awareness, and supporting the role of forest schools in climate adaptation.