

Psychological Pathways in Climate Change Education: Hope, Climate Anxiety, Emotion, Self-Efficacy, and Agency

A Narrative Integrative Review

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Background. Climate change education is increasingly understood as a cognitive, affective, and action-oriented process rather than as the transmission of scientific information alone. Learners' emotional and motivational responses — including hope, anxiety, fear, anger, grief, self-efficacy, and perceived agency may influence whether climate learning is associated with engagement, avoidance, or psychological distress.

Objective. This narrative integrative review synthesises research examining how psychological constructs are conceptualised and studied in climate change education and how they relate to climate engagement, pro-environmental behaviour, behavioural intentions, and psychological wellbeing.

Methods. This narrative integrative review synthesises 44 peer-reviewed sources published between 2012 and 2026. Sources were identified through Elsevier-related scholarly resources, Google Scholar, and citation tracking, and were selected through title-and-abstract screening based on their relevance to climate change education and psychological constructs including hope, anxiety, emotion, self-efficacy, and agency. Due to substantial heterogeneity in study designs, populations, measures, and outcomes, findings were synthesised narratively and organised into six thematic areas.

Results. The reviewed literature generally associates constructive hope, perceived efficacy, and agency with climate engagement and behavioural intentions. Climate anxiety and other negative emotions demonstrate more complex relationships with action: they may support attention, concern, and motivation when learners feel validated and have credible opportunities to respond, but may contribute to helplessness, avoidance, or distress when learners lack perceived control or emotional support. Participatory, place-based, experiential, and action-oriented approaches appear more promising than information-centred instruction alone. However, the evidence remains limited by the predominance of cross-sectional, self-report, and short-term studies, and few interventions explicitly assess emotional processing, sustained behaviour, or longer-term wellbeing.

Conclusions. Climate change education should integrate accurate scientific knowledge with emotional literacy, realistic hope, mastery experiences, collective action, and meaningful participation. Future research should use clearer construct definitions, culturally responsive measures, longitudinal and experimental designs, and behavioural and wellbeing outcomes that extend beyond immediate self-reported intentions.

Keywords: *climate change education; climate anxiety; eco-anxiety; climate emotions; hope; self-efficacy; agency; climate action; youth wellbeing*

1. Introduction: Climate change presents educational systems with a challenge that extends beyond the communication of scientific facts. Learners need opportunities to understand the physical and social dimensions

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of climate change, interpret its consequences, evaluate possible responses, and participate in individual and collective action (Sanson et al., 2019). Consequently, climate change education should be understood as a multidimensional process involving knowledge, emotion, motivation, identity, agency, and behaviour.

Traditional approaches to environmental education have often been influenced by a knowledge-deficit assumption, according to which increasing learners' scientific knowledge will automatically produce stronger concern and more responsible behaviour. Research in environmental education and psychology, however, indicates that the relationship between knowledge and action is neither linear nor automatic. Stevenson et al. (2018), for example, found that climate education increased adolescents' knowledge but did not directly increase behaviour; instead, knowledge was associated with concern and hope, which were in turn related to pro-environmental behaviour. Climate learning may generate hope, concern, fear, anger, guilt, grief, or helplessness (Kim & Kim, 2020; Jones & Whitehouse, 2021), and these responses may influence whether learners engage constructively, withdraw, or experience distress.

The psychological dimensions of climate change education are therefore important for both educational effectiveness and learner wellbeing. The central constructs examined in this review are climate hope, climate anxiety, discrete climate emotions, self-efficacy, collective efficacy, perceived agency, and pro-environmental behaviour. These constructs are related but conceptually distinct: hope concerns the perceived possibility of desirable change (Ojala, 2012); anxiety concerns emotional responses to perceived climate threats (Hickman et al., 2021); self-efficacy concerns perceived capability to perform an action (Sachisthal et al., 2025); and agency concerns the capacity to act intentionally within social and institutional conditions (Gal, 2026; Ruiz-Mallén et al., 2022).

A further challenge is that the literature is distributed across several disciplines. Relevant studies appear in environmental education, psychology, science education, public health, sustainability education, and climate communication, and differ considerably in the populations and educational contexts examined — from children and adolescents (Leger-Goodes et al., 2022) to university students (Yildiz, 2025), medical and nursing students (Schwienhorst-Stich et al., 2024; Wu et al., 2026), teachers (Herranen & Aksela, 2024), and participants in non-formal education (Ruiz-Mallén et al., 2022). This fragmentation makes it difficult for educators and curriculum designers to identify which psychological processes are most relevant to climate learning and which pedagogical approaches are most likely to support constructive engagement (Guimerà-Ballesta et al., 2026; Pert et al., 2026).

Although research on climate emotions and climate change education is expanding, the evidence remains dispersed across environmental education, psychology, science education, public health, and climate communication. This review therefore synthesises 44 peer-reviewed sources published between 2012 and 2026. The sources were identified through Elsevier-related scholarly resources, Google Scholar, and citation tracking and were selected through title-and-abstract screening according to their relevance to climate change education and psychological processes. The review focuses on hope, climate anxiety, discrete emotions, self-efficacy, agency, climate engagement, pro-environmental behaviour, and learner wellbeing, and on the relationship

between psychological processes and climate change education specifically, rather than on climate anxiety or pro-environmental behaviour in the general population (Hickman et al., 2021; Sanson et al., 2019).

1.1 Purpose of the Review

The purpose of this review is to synthesise literature on the psychological dimensions of climate change education and to identify implications for curriculum design, teacher education, learner wellbeing, and future research. The review addresses four questions:

- RQ1: How are hope, climate anxiety, discrete emotions, self-efficacy, and agency conceptualised in climate change education research?
- RQ2: What associations have been reported between these constructs and climate engagement, behavioural intentions, pro-environmental behaviour, or wellbeing?
- RQ3: Which instructional and programmatic features appear to support constructive psychological and behavioural outcomes?
- RQ4: What methodological, cultural, and conceptual gaps remain in the literature?

2. Conceptual Framework

2.1 Climate Knowledge

Climate knowledge refers to learners' understanding of the causes, mechanisms, consequences, uncertainties, and possible responses associated with climate change. Knowledge is an important foundation for informed participation, but it is not sufficient by itself to produce behaviour change. Learners may possess scientific knowledge while experiencing low perceived efficacy, limited access to action, or uncertainty about how to respond.

2.2 Climate Emotions: Climate emotions are affective responses associated with climate change and its anticipated consequences. These may include worry, fear, sadness, grief, anger, guilt, shame, hope, pride, and compassion. Emotions are not simply barriers to, or outcomes of, learning; they may also direct attention, support moral reasoning, and influence motivation.

2.3 Climate Anxiety: Climate anxiety refers broadly to emotional responses involving worry, fear, distress, or concern about climate change and its consequences. The construct is used inconsistently in the literature: some studies measure concern and worry, whereas others assess impairment, rumination, or clinically relevant distress. These forms should not be treated as equivalent, and in particular, climate anxiety should not automatically be interpreted as a mental disorder.

2.4 Hope: Hope is a multidimensional construct. Constructive hope involves recognition of climate risks together with the belief that meaningful action remains possible. By contrast, denial-based or unrealistic hope minimises the seriousness of climate change or assumes that technological or political solutions will emerge without sustained effort. This distinction matters because optimistic messaging that avoids the seriousness of climate change may not support meaningful engagement.

2.5 Self-Efficacy and Collective Efficacy: Self-efficacy concerns an individual's belief in their ability to perform a particular action. Collective efficacy concerns the belief that a group can act effectively to achieve a shared outcome. Climate change education can support efficacy by providing mastery experiences, opportunities for collaboration, feedback, and visible connections between action and outcomes.

2.6 Agency and Action Competence: Agency refers to learners' capacity to interpret situations, make decisions, and act intentionally. It is shaped not only by individual confidence but also by institutional opportunities, social

relationships, power, identity, and access to resources. Action competence therefore extends beyond personal behaviour to include critical understanding, participation, decision-making, and collective action.

2.7 A Proposed Psychological Pathway: The literature reviewed in this paper supports a tentative interpretive framework: climate learning is followed by appraisal and emotion, which in turn relates to efficacy and agency, which relates to action intention and behaviour. This pathway should not be interpreted as an established causal model; rather, it provides a framework for organising findings across studies. Climate knowledge may influence concern and emotional appraisal; efficacy and agency may determine whether concern becomes constructive engagement; and opportunities for action may reinforce hope and perceived efficacy.

3. Review Method

3.1 Review Design: This study used a narrative integrative review design to synthesise literature on the psychological dimensions of climate change education. A narrative integrative approach was selected because the available literature includes quantitative, qualitative, mixed-methods, intervention, conceptual, and review studies. The diversity of research designs, populations, psychological constructs, and outcome measures made statistical aggregation inappropriate. The review focuses on how hope, climate anxiety, eco-anxiety, discrete emotions, self-efficacy, agency, and related psychological processes are conceptualised and connected with climate learning, educational practice, learner wellbeing, and climate-related action.

3.2 Information Sources: Relevant literature was identified through searches of Elsevier-related scholarly resources and Google Scholar. Additional studies were identified through backward and forward citation tracking of relevant articles and review papers. The search was designed to capture literature at the intersection of climate change, psychology, and education, using combinations of terms including: “climate change education”, “climate education”, “climate learning”, “environmental education”, “climate anxiety”, “eco-anxiety”, “climate emotions”, “climate hope”, “self-efficacy”, “agency”, “action competence”, “climate action”, “pro-environmental behaviour”, and “youth wellbeing”. The search covered publications dated from 2012 to 2026.

3.3. Screening Procedure: The initial search results were screened primarily on the basis of titles and abstracts. Articles were retained for further consideration when their abstracts indicated a clear relationship between at least one psychological construct and climate change education, climate learning, environmental education, sustainability education, or a structured educational intervention. The screening process involved three stages:

- Title screening: records were examined for their apparent relevance to climate change, psychological processes, and education.
- Abstract screening: abstracts were reviewed to determine whether the article addressed at least one of the review's psychological constructs and included an educational or learning-related dimension.
- Full-text relevance checking: articles retained after abstract screening were examined to confirm their connection with climate change education and their relevance to the review questions.

Citation tracking was used to identify additional relevant sources that were not located through the initial search. The final corpus comprised 44 sources. Because the selection was based on relevance and thematic connection rather than a fully registered systematic-review protocol, the present study is reported as a narrative integrative review rather than a systematic review or meta-analysis.

3.4 Eligibility Criteria: Sources were included when they satisfied the following criteria:

- Published in a peer-reviewed journal between 2012 and 2026.
- Available through Elsevier-related scholarly resources, Google Scholar, or citation tracking.
- Addressed climate change education, climate learning, environmental education, sustainability education, or an educational intervention.

- Examined at least one psychological construct, including hope, climate anxiety, eco-anxiety, fear, anger, guilt, grief, concern, self-efficacy, collective efficacy, agency, action competence, or psychological wellbeing.
- Focused on learners, young people, teachers, university students, professional trainees, or educational practitioners.
- Reported empirical findings, theoretical analysis, pedagogical analysis, or a review relevant to the psychological dimensions of climate education.

Sources were excluded when they addressed climate anxiety or pro-environmental behaviour without an educational or learning-related dimension; focused exclusively on climate science, environmental technology, policy, or economics; did not address any psychological, affective, motivational, behavioural, or wellbeing-related outcome; were not available as peer-reviewed scholarly publications; or had no identifiable connection with the review questions.

3.5 Data Extraction: Information was extracted and organised under the following categories: author and publication year; country or geographical context; participant group and sample size; educational setting; psychological construct examined; research design and method; intervention or pedagogical approach, where applicable; outcome measures; main findings; and relevance to climate change education.

The sources were grouped into six thematic categories: (1) hope and constructive engagement; (2) climate anxiety, eco-anxiety, and psychological distress; (3) discrete emotions and affective engagement; (4) self-efficacy, agency, and knowledge–action relationships; (5) pedagogical approaches and instructional interventions; and (6) existing reviews and meta-level syntheses. Some sources addressed more than one theme. To avoid double-counting, each source was assigned a primary thematic category for tabular presentation, while cross-cutting findings were considered in the narrative synthesis.

3.6 Approach to Synthesis: The findings were synthesised narratively. First, the included sources were examined for recurring concepts and relationships. Second, studies were compared according to their populations, educational contexts, methods, and outcomes. Third, convergent findings, contradictory findings, and methodological limitations were identified within each theme. The synthesis does not assume that associations reported in cross-sectional studies demonstrate causation. Findings from conceptual articles and previous reviews were used to support theoretical interpretation and contextualisation, whereas claims about relationships between psychological constructs and outcomes were based primarily on empirical studies.

3.7 Methodological Qualification: The 44 sources included in this review comprise different types of scholarly publications, including empirical studies, intervention evaluations, qualitative investigations, conceptual papers, and previous reviews. Accordingly, they should not be interpreted as methodologically equivalent: empirical studies provide evidence about observed associations or intervention outcomes, while conceptual and review papers contribute theoretical framing and broader interpretation. A formal risk-of-bias assessment was not conducted because the review was designed as a narrative integrative synthesis across heterogeneous source types. Future work could extend this review through a systematic search, independent duplicate screening, formal quality appraisal, and protocol registration.

4. Literature Review

The 44 included sources are organised into six thematic tables. Because the corpus contains empirical studies, intervention evaluations, qualitative investigations, conceptual papers, and previous reviews, each table identifies the design or source type for each publication alongside its context, sample, method, and key findings. The findings are presented as a narrative synthesis rather than as a comparison of equivalent effect sizes; conclusions drawn from cross-sectional studies, intervention studies, conceptual papers, and previous reviews are interpreted according to their different levels and types of evidence.

4.1 Theme 1: Hope, Optimism, and Constructive Engagement in CCE

Table 1. Sources addressing hope, optimism, and constructive engagement in cce

Author(s) & Year	Type	Context/Sample	Design/ Method	Key Finding
Benoit et al. (2025)	Intervention	Adolescents aged 14-18, online/crowdsourced sample, USA (n = 1,039)	Randomized controlled trial (3-arm video intervention)	A brief positive “selfie” video increased adolescents' hope and sense of agency but did not reduce climate anxiety or shift behavioural intentions after a single exposure.
Finnegan (2022)	Empirical	Secondary students aged 16-18 and teachers, England (n = 512 students; 69 teachers)	Cross-sectional questionnaire (validated hope/action-competence scales)	Hope and action competence were strongly positively correlated; teacher practices that validated negative emotion while sustaining a positive outlook best predicted student hope.
Finnegan and d’Abreu (2024)	Conceptual	Conceptual/theoretical paper synthesising CCE and psychology literature	Theoretical/conceptual model development	Proposed the “Hope Wheel” model, combining handrails (honesty, awareness, spaceholding, action), guardrails (anxiety, misinformation, false hope), and lenses (justice,

				complexity, empathy) for hope-based pedagogy.
Li and Monroe (2019)	Empirical	High-school students, USA (n = 728)	Cross-sectional survey, path analysis (Reasonable Person Model)	Perceived personal and collective effectiveness (being able to act and make a difference) was the strongest direct predictor of adolescents' climate hope.
Ojala (2012)	Empirical	Teenagers and young adults, Sweden (n = 723 and n = 381)	Two cross-sectional questionnaire studies	Constructive hope predicted higher pro-environmental behaviour, whereas denial-based hope predicted lower engagement; hope functioned as a motivational rather than merely emotional state.
Ratinen and Uusiautti (2020)	Empirical	Elementary and secondary students, Finland (n = 950)	Cross-sectional survey; regression, correlation, ANOVA	Students showed relatively high constructive (versus denial) hope; climate knowledge, gender, and constructive hope were significant predictors of mitigation-related attitudes.
Stevenson et al. (2018)	Empirical	Adolescents, North Carolina, USA (n = 1,041)	Pre/post treatment-control path model	Climate education raised knowledge but not behaviour directly; knowledge predicted concern and hope, which in turn predicted pro-environmental behaviour; low SES limited gains.
Ojala (2023)	Review	Narrative review of climate-change hope	Narrative review	Cognitive climate-change hope consistently relates positively to engagement,

		and engagement research		while hope-as-emotion findings are more mixed; collective climate action itself can generate constructive hope, and interventions should move beyond simple optimistic messaging.
Buchanan et al. (2021)	Conceptual	Conceptual/practice paper on children, climate anxiety, and hope, Australia	Conceptual/practice-focused paper	Argued that supporting children's hope, alongside acknowledging their climate anxiety, is central to healthy engagement, with implications for how educators and parents talk with children about climate change.

4.2 Theme 2: Climate Anxiety, Eco-Anxiety, and Psychological Distress

Table 2. Sources addressing climate anxiety, eco-anxiety, and psychological distress

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
Mateer (2024)	Conceptual	Theoretical/philosophical essay on educator-student solidarity, USA	Theoretical essay	Argued that intergenerational solidarity between educators and students can help channel climate anxiety into constructive action while sustaining realistic hope and agency.
Schwienhorst-Stich et al. (2024)	Intervention	Medical students, Germany, pre-post design (n = 458 initial; 396 completing)	Pre/post survey (quantitative + qualitative)	Helplessness, fear, and disappointment were the most common initial emotions among medical students; planetary-health teaching significantly increased confidence and motivation to act.

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
Yildiz (2025)	Empirical	University students in youth-office activities, eastern Anatolia, Turkey (n = 881)	Cross-sectional survey	University students reported moderate climate awareness, anxiety, and hope; higher awareness correlated with both greater anxiety and greater hope.
Hickman et al. (2021)	Empirical	Children and young people aged 16-25, ten countries (n = 10,000)	Large-scale international cross-sectional survey	Climate anxiety and distress were widespread across ten countries and linked to perceived governmental inaction and feelings of betrayal, affecting daily functioning.
Leger-Goodes et al. (2022)	Review	Children and youth under 18, international scoping review (18 studies)	Scoping review	Children experience measurable eco-anxiety and related distress (sadness, anger, fear); adaptive coping such as constructive hope buffered negative mental-health outcomes.
Garrison and Houston (2026)	Empirical	Undergraduate planning students, USA (n = 194)	Cross-sectional survey	Climate anxiety was more strongly associated with student action than climate hope, suggesting both emotions can productively coexist in climate-focused classrooms.
Sanson et al. (2019)	Conceptual	Global synthesis on children and youth impacted by the climate crisis	Narrative synthesis/perspectives paper	Children and youth are highly vulnerable to climate impacts; building agency, self-efficacy, and hope, alongside listening

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
		(conceptual/perspectives paper)		and active-engagement opportunities, helps young people cope and channel anxiety into constructive engagement.
Nimo et al. (2025)	Conceptual	Perspective article on positive psychology and psychological capital for climate anxiety	Theoretical perspective/commentary	Proposed psychological capital, cognitive reframing, and mindfulness as tools to transform climate anxiety into proactive engagement, calling for these strategies to be embedded in public-health education and policy.

4.3 Theme 3: Emotions and Affective Engagement in Climate Learning

Table 3. Sources addressing emotions and affective engagement in climate learning

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
Trott (2022)	Empirical	Children aged 10-12, multi-site CCE programme, USA (n = 55)	Mixed-methods (survey + focus groups)	A CCE programme strengthened pro-environmental attitudes and respect for nature; children's negative emotions were buffered by positive emotions generated through youth-led climate action.
Kim and Kim (2020)	Empirical	High-school students, science-society-issue (SSI) club, South Korea (n = 10)	Qualitative, control-value theory analysis	Negative emotions (anxiety, guilt, fear) persisted after club activities but coexisted with rising positive emotions; guilt and anxiety sometimes helped drive students toward action.

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
Jones and Whitehouse (2021)	Empirical	Primary-school pupils aged 9-10, ethnographic study, England (~60 children)	Ethnographic observation, drawings, diaries	Primary pupils expressed strong emotions, including anger, in response to climate injustice; pedagogies that allowed emotional expression supported wellbeing rather than avoidance.
González-Muñoz et al. (2024)	Empirical	Secondary-school students, southern Spain (n = 1,050)	Cross-sectional survey	Formal education tended to raise worry, powerlessness, and fear while reducing positive emotion; social media amplified emotional intensity more than traditional media.
Wang and Chen (2022)	Intervention	Middle-school students, nine schools, three coastal cities, China (n = 1,730)	Randomized field experiment (video-induced emotion)	A fear-inducing treatment reduced self-reported mitigation behaviour, while a knowledge-only lecture increased both knowledge and mitigation behaviour via concern and involvement.
Oberauer et al. (2023)	Intervention	Secondary students aged 13-19, Austria, k.i.d.Z.21 programme (n = 315, 2013-2015; n = 246, 2021)	Pre/post quasi-experimental, multilevel modelling	Emotions clustered into a “stimulation” group (e.g., anger, worry) associated with higher complexity thinking and an “attenuation” group (e.g., apathy, hopefulness) associated with lower complexity thinking.

4.4 Theme 4: Self-Efficacy, Agency, and Behavioural/Knowledge-Action Outcomes

Table 4. Sources addressing self-efficacy, agency, and behavioural/knowledge-action outcomes

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
Howard-Jones et al. (2023)	Intervention	Secondary students aged 11-14, UK (n = 62); teachers	Pre/post survey, mixed methods	A brief teacher-administered survey improved measurement of self-efficacy and action intention; self-efficacy rose post-intervention while

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
		implementing survey		intention to act did not, prompting curriculum revisions.
Kolenatý et al. (2022)	Intervention	Students, 47 schools, Czech Republic (n = 123)	Quasi-experimental pre/post + focus groups	Climate knowledge increased concern, which raised self-efficacy and willingness to act; knowledge was identified as a key initial driver of the climate action pathway.
Gal (2026)	Empirical	Primary school students, grades 5-6, Israel (n = 304)	Cross-sectional survey; Structural Equation Modelling	General environmental knowledge was the strongest predictor of children's environmental communicative agency; curiosity and future-oriented tools mediated the knowledge-action pathway.
Michel et al. (2026)	Empirical	Higher-education students, participatory action-research course, USA (n = 13 interviewed)	Qualitative case study; semi-structured interviews	Participatory, co-designed climate action projects deepened students' understanding of CCE and built confidence and legitimacy as climate actors through co-ownership and public engagement.
Salvi and Scherer (2025)	Empirical	Children, qualitative study on agency in the climate crisis, UK	Qualitative interviews	Children articulated an agentic response to climate crisis (“once you see what it does... you want to stop it”), positioning themselves as active participants rather than passive victims.
Herranen and Aksela (2024)	Empirical	Teachers from 18 countries, professional-development camp (n = 22 survey; 19 interviews)	Mixed-methods case study (survey + interviews)	Teachers reported willingness to develop sustainability teaching but the lowest self-efficacy specifically around supporting students' climate action; content knowledge correlated with action-related self-efficacy.

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
Sachisthal et al. (2025)	Empirical	Youth aged 16-24, Netherlands (n = 436)	Cross-sectional psychometric network analysis	Self-efficacy was the most central, influential construct in a network of engagement variables and was directly linked to information-seeking behaviour among Dutch youth.
Ruiz-Mallén et al. (2022)	Empirical	Two grassroots non-formal education initiatives (community gardening, school energy project), Barcelona, Spain	Qualitative case study; interviews and document review	Grassroots, non-formal educational initiatives fostered young people's critical reflection, sense of responsibility, and agency for climate-resilient action, though integration into formal schooling remained limited.
Hohenhaus et al. (2023)	Review	48 studies, youth aged 12-25, six databases, international scoping review	Scoping review (Arksey & O'Malley framework)	Identified external factors (social environment, place, knowledge, leadership, goal-setting) and internal factors (self-efficacy, identity/agency/action competence, systems thinking) that jointly drive successful youth climate-behaviour programmes.

4.5 Theme 5: Pedagogical Approaches and Instructional Interventions

Table 5. Sources addressing pedagogical approaches and instructional interventions	Type	Context / Sample	Design / Method	Key Findings
Author(s) & Year				
Kortam and NasrAldeen (2026)	Intervention	Ninth-grade students, two intact classes, northern Israel (n = 59, Druze school)	Classroom-based quasi-experiment + interviews	A metacognitive guidance unit improved sustainable food literacy, climate perceptions/attitudes,

<i>Table 5. Sources addressing pedagogical approaches and instructional interventions</i> Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
				and constructive hope; perceptions of climate change were the strongest predictor of hope.
Shoreman-Ouimet (2021)	Conceptual	University students, USA (pedagogical/practice essay)	Reflective pedagogical/practice essay	Outlined classroom strategies combining preliminary emotional assessment, campus-based awareness projects, and community service-learning to counter apathy and increase student engagement.
Jang (2022)	Intervention	High-school students, Suncheon City, South Korea (n = 400)	Pre/post quasi-experimental survey	A short educational programme significantly shifted students' perceptions of climate change causes and solutions toward collective, policy-oriented responses.
Rooney-Varga et al. (2014)	Intervention	University students producing public-service announcements, USA	Curriculum design + external evaluation (mixed methods)	Student-produced public-service announcements increased climate literacy for both producers and viewers and fostered

<i>Table 5. Sources addressing pedagogical approaches and instructional interventions</i> Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
				intrinsic motivation, critical thinking, and a sense of agency.
Liu et al. (2026)	Intervention	Undergraduate chemistry students, USA	Pre/post survey with qualitative reflections	A green-chemistry biodiesel laboratory activity raised undergraduates' hope and self-efficacy regarding climate change and narrowed a pre-existing gender gap in hope-related outcomes.
Aksel Stenberdt and Makransky (2023)	Intervention	High-school students, immersive virtual reality (IVR) waste-sorting simulation, Denmark (n = 173)	Pre-registered 2x2 experimental design	An immersive virtual-reality waste-sorting simulation increased students' knowledge, intentions, self-efficacy, and response efficacy; self-efficacy predicted behavioural intentions.
Park et al. (2020)	Empirical	16 Korean and international CCE programmes, comparative programme analysis	Document/programme content analysis	Most CCE programmes emphasised knowledge/skill development over action; action-emphasised programmes were

<i>Table 5. Sources addressing pedagogical approaches and instructional interventions</i> Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
				less structured but promoted more reflection and socio-political engagement.

4.6 Theme 6: Existing Reviews and Meta-Level Syntheses

Table 6. Sources addressing existing reviews and meta-level syntheses

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
Jackson et al. (2025)	Review	School-based climate-literacy programmes for children <18, UK-led systematic review (16 studies)	Systematic review (6 academic + 4 grey-literature databases)	Most reviewed programmes built resilience through participatory, real-world learning, but only a minority explicitly supported children's emotional processing of climate-related feelings.
Wu et al. (2026)	Review	Nursing students, international scoping review	Scoping review	Synthesized assessment tools, risk factors, and intervention strategies for climate anxiety among nursing students, highlighting limited evidence and calling for more targeted curricular responses.
Pert et al. (2026)	Review	Youth in North America, narrative/scoping-style review	Narrative/scoping-style literature review	Traditional climate information delivery can heighten youth distress, whereas place-based, empowerment-oriented education better supports both learning outcomes and mental wellbeing.

Author(s) & Year	Type	Context / Sample	Design / Method	Key Findings
Galeotti et al. (2024)	Review	Systematic review of the behavioural-economics literature on CCE (86 studies)	Systematic review	Across 86 studies, most CCE interventions reported positive pro-environmental outcomes, but few examined actual behaviour; nudge- and engagement-based designs were most common.
Guimerà-Ballesta et al. (2026)	Review	Secondary-education CCE, international narrative review	Narrative and integrative review	Students' social representations of climate change remain fragmented and superficial; curricula are largely science-centred, under-supporting affective, ethical, and justice-oriented dimensions.

5. Results: Narrative Synthesis by Theme

5.1 Hope and Constructive Engagement

The literature generally distinguishes constructive hope from denial-based hope. Constructive hope involves an honest recognition of climate risk combined with a belief that individual and collective action remain possible. Across several studies, constructive hope was associated with climate engagement, mitigation attitudes, action competence, and perceived effectiveness. Ojala's (2012) research distinguished constructive hope from hope that minimises or denies climate change: constructive hope was associated with stronger pro-environmental engagement, whereas denial-based hope was associated with weaker engagement. Similar relationships were reported among Finnish and English students, where hope was related to climate knowledge, action competence, and mitigation attitudes (Finnegan, 2022; Ratinen & Uusiautti, 2020).

The evidence also suggests that hope is closely connected to efficacy. Li and Monroe's (2019) study of high-school students found that perceived personal and collective effectiveness was an important predictor of climate hope, a finding that is educationally significant because it suggests hope may be strengthened through opportunities for meaningful participation rather than through positive communication alone. Intervention evidence remains more limited: Benoit et al. (2025) reported that a brief positive video intervention increased adolescents' hope and perceived agency but did not produce immediate changes in climate anxiety or behavioural intentions, indicating that a single exposure may influence emotional or motivational states without producing measurable behavioural change. Overall, constructive hope appears to be a potentially important psychological resource, but claims about its causal effect on sustained behaviour should remain cautious.

5.2 Climate Anxiety and Psychological Distress: Climate anxiety and climate-related distress are increasingly documented among children, adolescents, university students, and professional trainees. Hickman et al.'s (2021) multinational study reported widespread climate anxiety among young people and identified relationships between distress, perceived governmental inaction, and feelings of betrayal. Other reviews similarly find that children and young people may experience sadness, anger, fear, worry, and helplessness in response to climate change (Leger-Goodes et al., 2022). The educational meaning of climate anxiety is complex. Anxiety may reflect an appropriate response to a real and serious threat, but its consequences depend on intensity, duration, perceived control, social support, and opportunities for action. When learners perceive no meaningful response pathway, climate-related concern may be associated with helplessness or avoidance; when concern is combined with support, efficacy, and collective action, it may instead contribute to engagement (Garrison & Houston, 2026; Yildiz, 2025). Studies of medical and nursing students suggest that structured planetary-health and climate education can increase confidence and motivation to act, even when learners initially report fear, helplessness, or disappointment (Schwienhorst-Stich et al., 2024; Wu et al., 2026), suggesting that education may support psychological adaptation when it combines accurate information with opportunities to understand professional and collective responses. However, climate anxiety should not be treated as inherently adaptive: the educational goal should not be to increase anxiety but to acknowledge climate-related concerns while developing emotional coping, efficacy, solidarity, and action competence (Mateer, 2024; Nimo et al., 2025).

5.3 Discrete Emotions and Affective Engagement:

Several studies examine specific emotions rather than general anxiety or hope, including fear, guilt, anger, sadness, worry, and positive emotions associated with participation and achievement. Negative emotions are not uniformly associated with harmful outcomes: Kim and Kim (2020) found that anxiety, fear, and guilt persisted among students participating in a climate-related science–society–issue club, but these emotions coexisted with positive emotions and sometimes supported engagement. Jones and Whitehouse (2021) similarly reported that primary-school pupils expressed anger in response to climate injustice and that allowing emotional expression supported, rather than undermined, learning.

At the same time, fear-based communication can be counterproductive. Wang and Chen (2022) found that a fear-inducing climate education treatment reduced self-reported mitigation behaviour among middle-school students, whereas a knowledge-focused intervention increased knowledge and mitigation behaviour through concern and involvement, suggesting that emotional intensity alone does not guarantee constructive engagement. Oberauer et al. (2023) reported that some emotions, including anger and worry, were associated with more complex thinking about climate change, whereas apathy and unexamined positive affect were associated with lower levels of complexity thinking, indicating that the educational value of an emotion depends partly on whether learners are given opportunities to interpret and process it. The evidence therefore supports an appraisal-based approach: rather than categorising emotions as positive or negative, educators should consider whether an emotion promotes attention, reflection, efficacy, dialogue, and action, or instead produces helplessness and withdrawal.

5.4 Self-Efficacy, Agency, and the Knowledge–Action Relationship

Self-efficacy and agency emerge as central constructs linking climate knowledge with engagement. Several studies report that climate knowledge is associated with concern, while concern and perceived efficacy are related to willingness to act; however, knowledge does not consistently translate into behaviour without a perceived pathway to action. Stevenson et al. (2018) found that climate education increased knowledge among adolescents but did not directly increase behaviour; instead, knowledge was associated with concern and hope, which were related to pro-environmental behaviour, illustrating the importance of psychological mediators in the knowledge–action relationship. Kolenatý et al. (2022) reported a related pathway in which climate knowledge increased concern, which was associated with self-efficacy and willingness to act. Sachisthal et al. (2025) identified self-efficacy as a central construct in a psychological network of climate engagement among Dutch youth, and Gal's (2026) structural equation model similarly identified environmental knowledge as an important predictor of children's environmental communicative agency.

Qualitative studies add a social and institutional dimension. Participatory action research, community gardening, school energy projects, and other grassroots programmes provided learners with opportunities to co-design activities, collaborate with others, and engage publicly (Michel et al., 2026; Ruiz-Mallén et al., 2022; Salvi & Scherer, 2025). These experiences were associated with stronger confidence, responsibility, critical reflection, and perceived legitimacy as climate actors. The evidence suggests that self-efficacy is important but not sufficient: learners may feel capable of acting while lacking institutional support, resources, social approval, or opportunities

to influence larger systems. Climate change education should therefore develop both individual and collective efficacy (Herranen & Aksela, 2024; Hohenhaus et al., 2023).

5.5 Pedagogical Approaches and Instructional Interventions

The most promising pedagogical approaches combine scientific content with participation, application, experiential learning, and reflection. Examples include student-produced media, immersive virtual reality, green-chemistry laboratory work, metacognitive guidance, service learning, participatory action research, and community-based projects. Rooney-Varga et al. (2014) found that student-produced public-service announcements supported climate literacy, critical thinking, intrinsic motivation, and agency. A virtual-reality waste-sorting intervention increased knowledge, self-efficacy, response efficacy, and behavioural intentions (Aksel Stenberdt & Makransky, 2023), and a green-chemistry laboratory activity was associated with increased hope and self-efficacy among university students (Liu et al., 2026).

Non-formal and place-based initiatives may be particularly valuable because they connect learning with visible local problems and opportunities for action. Community gardening and school energy projects, for example, can help learners see how collective action operates in practice (Ruiz-Mallén et al., 2022), and such approaches may also provide emotional benefits by transforming abstract threats into manageable and socially supported projects. Nevertheless, the literature indicates that many programmes remain knowledge-centred: Park et al. (2020) found that climate change education programmes often prioritised knowledge and skills over political participation, reflection, and action, and reviews of school-based programmes likewise suggest that participatory learning is common in stronger interventions, but explicit emotional-processing components remain uncommon (Jackson et al., 2025). Teacher preparation is a major concern: Herranen and Aksela (2024) found that teachers were more confident in delivering sustainability content than in supporting students' climate action, indicating that professional development should include not only subject knowledge but also facilitation of dialogue, emotional processing, participatory planning, action competence, and referral pathways for learners experiencing significant distress.

5.6 Existing Reviews and Meta-Level Syntheses

Previous reviews support several of the patterns identified in this synthesis. Reviews of eco-anxiety among children and young people report that climate-related worry can be accompanied by sadness, anger, fear, and distress, while constructive coping and hope may reduce negative outcomes (Leger-Goodes et al., 2022). Reviews of climate-action programmes identify self-efficacy, agency, identity, social support, leadership, place, and goal-setting as important conditions for engagement (Hohenhaus et al., 2023). A review of school-based climate-literacy programmes found that participatory and real-world learning may support resilience and wellbeing, but that emotional processing is rarely a clearly defined component (Jackson et al., 2025). A behavioural-economics review found that many interventions report positive outcomes, although relatively few measure observed or sustained behaviour (Galeotti et al., 2024). Reviews of secondary-school climate education further suggest that curricula remain predominantly science-centred and provide insufficient attention to affective, ethical, social, and justice-oriented dimensions (Guimerà-Ballesta et al., 2026; Pert et al., 2026).

The present review extends these findings by examining how specific psychological constructs interact. In particular, it highlights the importance of distinguishing constructive hope from denial-based hope, climate concern from distress, and individual self-efficacy from collective agency.

6. Thematic Discussion

6.1 Psychological Processes Are Central to Climate Learning

The reviewed literature challenges the assumption that climate change education operates primarily through knowledge acquisition. Knowledge is necessary for informed engagement, but its effects are shaped by emotional appraisal, efficacy, social identity, perceived control, and opportunities for participation. A tentative model emerging from the literature is that knowledge may increase concern, concern may activate emotional responses, and self-efficacy and agency may determine whether these responses lead to constructive action or disengagement. This model should be tested through longitudinal and experimental research rather than treated as established.

6.2 Hope Should Be Realistic and Action-Oriented

Hope is most educationally useful when it is grounded in reality and connected to action. Avoiding difficult climate information may produce temporary comfort but does not necessarily support understanding or agency; conversely, presenting climate change only through catastrophic narratives may increase fear without providing learners with a credible response pathway. Constructive hope can be cultivated through honest discussion of climate risks, recognition of uncertainty and complexity, examples of collective achievement, opportunities for practical action, collaboration and peer support, reflection on values and justice, and feedback showing how action produces change. Hope should therefore be treated as an educational process rather than as a communication style.

6.3 Anxiety Should Be Acknowledged but Not Amplified

The literature does not support a simple opposition between hope and anxiety; learners may experience both simultaneously. Anxiety can signal moral concern and motivate information-seeking or action, but it can also become debilitating when associated with helplessness, isolation, or perceived institutional betrayal. Teachers should avoid dismissing climate-related worry and should not frame distress as evidence of weakness. At the same time, climate lessons should not intentionally intensify anxiety. Supportive teaching requires age-appropriate information, respectful dialogue, structured reflection, collaborative action, and awareness of when referral to school counsellors or mental-health professionals may be appropriate.

6.4 Agency Is Both Psychological and Structural

Self-efficacy is important because learners are more likely to act when they believe they can perform an action effectively. However, individual confidence alone cannot address structural constraints. Climate agency is also shaped by school culture, peer relations, family expectations, community opportunities, institutional policies, and

access to decision-making. Climate change education should consequently move beyond individual lifestyle advice; learners should be encouraged to examine systems, institutions, policies, inequalities, and collective strategies. This is especially important for climate justice education, where the distribution of responsibility, risk, and power must be addressed.

6.5 Teachers Require Specialised Preparation

Teachers are central to the emotional and ethical quality of climate learning. They must manage scientific uncertainty, contested viewpoints, emotional responses, political sensitivity, and the boundaries between educational support and mental-health intervention. Professional development should support teachers in understanding climate science and local impacts, explaining uncertainty accurately, facilitating emotionally safe discussions, distinguishing concern from clinically significant distress, designing participatory projects, developing student efficacy and agency, connecting students with community action, and using assessment methods that capture more than factual knowledge.

6.6 International and Cross-Cultural Perspectives

The reviewed literature spans more than fifteen countries, and comparing findings across national contexts reveals both convergence and divergence in how psychological constructs appear to operate in CCE. In Northern Europe, Ratinen and Uusiantti (2020) found that Finnish students reported relatively high constructive hope alongside solid climate knowledge, while Ojala (2012) found in two large Swedish samples that constructive hope, but not denial-based hope, was associated with greater pro-environmental engagement among teenagers and young adults. These Nordic findings broadly align with UK evidence: Finnegan (2022) found hope and action competence strongly correlated among English secondary students, and Howard-Jones et al. (2023) found that self-efficacy, though improvable through brief interventions, does not automatically translate into stronger intention to act — a pattern that recurs across very different national settings.

East Asian contexts add a further layer of nuance. In South Korea, Kim and Kim (2020) observed that negative emotions such as anxiety and guilt persisted alongside rising positive emotions in a science–society–issue club, and in some cases appeared to accompany rather than inhibit action, while Jang (2022) found that a short educational programme could meaningfully shift Korean students' beliefs about the causes and solutions of climate change toward collective, policy-oriented responses. In China, Wang and Chen (2022) found that a fear-inducing treatment reduced self-reported mitigation behaviour among middle-school students across three coastal cities, whereas a knowledge-focused lecture increased both knowledge and behaviour via concern and involvement — an empirical observation consistent with the more cautionary, theoretical arguments made by Mateer (2024) and Finnegan and d'Abreu (2024) in Western contexts regarding fear-based messaging.

Southern and Central European studies extend this picture further. In Spain, González-Muñoz et al. (2024) found that formal education tended to be associated with worry, powerlessness, and fear and with reduced positive emotion among secondary students, with social media appearing to amplify emotional intensity more than traditional media; a related non-formal programme in Barcelona studied by Ruiz-Mallén et al. (2022) found that

community-based education — gardening and school energy projects — was associated with critical reflection and agency. In Austria, Oberauer et al. (2023) linked specific emotion clusters to complexity thinking, with anger and worry associated with more sophisticated reasoning about climate causes and consequences than apathy or unexamined hopefulness. In the Czech Republic, Kolenatý et al. (2022) traced a knowledge-concern-efficacy-willingness pathway across 47 schools that resembles the model proposed by Stevenson et al. (2018) using an adolescent sample in the United States, suggesting that this sequential pathway may recur reasonably consistently across different Western educational systems, though direct causal comparison across these studies is not possible given their different designs.

Findings from the Middle East and Türkiye reinforce the apparently dual role of anxiety identified elsewhere. In Israel, Kortam and NasrAldeen (2026) found that a metacognitive guidance intervention was associated with improved sustainable food literacy and hope among ninth-grade students in a Druze school, and Gal (2026) found that general environmental knowledge was the strongest predictor of children's environmental communicative agency in their sample. In Türkiye, Yildiz (2025) reported that higher climate awareness was associated with both greater anxiety and greater hope among university students, a pattern consistent with Garrison and Houston (2026), who found in a US planning-education sample that climate anxiety was more strongly associated with student action than hope — together suggesting that anxiety and hope may coexist rather than function as opposing forces.

Large multinational studies help situate these smaller, context-specific findings within a broader picture. Hickman et al. (2021) surveyed 10,000 young people across ten countries and found climate anxiety and distress to be widespread and associated with perceptions of governmental inaction and betrayal, a pattern echoed in Nimo et al.'s (2025) call for psychological-capital-based coping strategies and in Wu et al.'s (2026) scoping review of climate anxiety among nursing students internationally. Similarly, Herranen and Aksela (2024) surveyed teachers from 18 countries and found a recurring pattern: teachers reported reasonable confidence in delivering climate content but the lowest self-efficacy specifically around supporting students' climate action — a finding that recurs in national studies from Israel, the UK, and Germany. Schwienhorst-Stich et al. (2024), studying German medical students, similarly found that structured planetary-health teaching was associated with increased confidence and motivation to act, even among students who began with high levels of helplessness and fear, suggesting that targeted teacher and curriculum investment in student agency may matter as much as national context.

Overall, this cross-national comparison suggests that the core psychological patterns identified in this review — the salience of self-efficacy and constructive hope, the complex, double-edged nature of anxiety, and the persistent knowledge–action gap — recur with some consistency from Scandinavia to East Asia to the Middle East, although the studies' differing designs, samples, and measures mean this should be read as a pattern of convergence rather than a confirmed cross-cultural finding. What appears to vary more by country is not whether these constructs are present, but how strongly particular emotions (fear, guilt, anger) are elicited by prevailing pedagogical style and media environment, and how well local teacher-training systems equip educators to respond.

6.7 Relationship to Findings from Other Reviews

The patterns identified in this narrative synthesis align closely with, and in some respects extend, conclusions reached by other reviews addressing overlapping literatures. Leger-Goodes et al. (2022), in a scoping review of eco-anxiety in children, similarly concluded that constructive hope may buffer negative mental-health outcomes associated with climate distress — a conclusion this review's synthesis of hope-related studies (Section 5.1) supports and extends by identifying perceived personal and collective effectiveness as a specific proximal correlate of that hope. Jackson et al. (2025), reviewing school-based resilience and wellbeing programmes, found that most interventions build resilience through participatory, real-world learning but that only a minority explicitly support children's emotional processing; this review's synthesis of pedagogical interventions (Section 5.5) reaches a closely related conclusion, lending convergent support to the observation that emotional-processing components remain a consistent gap in CCE programme design internationally.

Galeotti et al. (2024), applying a behavioural-economics lens across 86 studies, found that most CCE interventions report positive pro-environmental outcomes but that few measure actual behaviour rather than intentions — a methodological limitation that recurs throughout the present review's source set and is reflected in this paper's own call for more longitudinal, behaviourally-grounded research (Section 8). Hohenhaus et al.'s (2023) scoping review of 48 youth climate-action programmes identified self-efficacy, agency, identity, and systems thinking as apparently important internal conditions for behaviour change, complemented by external factors such as social environment and leadership opportunities; this parallels the self-efficacy-centred pathway described in Section 5.4 of the present review, though Hohenhaus et al. additionally highlight systems thinking as a distinct internal factor that received comparatively little attention among the hope- and anxiety-focused sources reviewed here, suggesting a productive area for future integration between these two strands of literature.

Guimerà-Ballesta et al. (2026) and Pert et al. (2026), in their respective narrative reviews of secondary-school CCE and youth wellbeing, both note that curricula remain largely science-centred and appear to under-support the affective, ethical, and justice-oriented dimensions of climate learning — an observation that resonates with this review's discussion of the persistent knowledge-action gap and the relative neglect of teacher preparation for emotional facilitation. Where this review may add to that existing literature is in tracing how specific psychological constructs — constructive versus denial-based hope, discrete emotions such as guilt and anger, and self-efficacy — appear to interact, rather than treating “psychological wellbeing” or “engagement” as a single undifferentiated outcome, as several of the broader reviews above tend to do.

7. Implications for Climate Change Education

7.1 Curriculum Design

Curricula should integrate cognitive, emotional, ethical, and action-oriented outcomes. A balanced unit might include a scientific explanation of climate processes, analysis of local and global impacts, structured discussion of learner emotions, examination of justice and responsibility, evaluation of possible responses, collaborative action planning, and reflection on outcomes and learning.

7.2 Assessment

Assessment should distinguish among several related but distinct dimensions: climate knowledge, systems thinking, emotional literacy, self-efficacy, collective efficacy, agency, action competence, behavioural intention, observed or reported behaviour, and wellbeing or emotional burden. A single climate-literacy score cannot adequately represent these dimensions.

7.3 Teacher Education

Teacher education programmes should include climate communication, emotional facilitation, participatory pedagogy, action competence, and wellbeing-sensitive practice. Teachers should not be expected to provide clinical treatment, but they should know how to respond appropriately to distress and when to refer learners for additional support.

8. Limitations of the Evidence

The evidence base has several limitations. First, the reviewed literature is methodologically heterogeneous and includes cross-sectional surveys, qualitative studies, quasi-experimental interventions, conceptual papers, and previous reviews. These sources provide different kinds of evidence and should not be interpreted as equivalent. Second, many studies rely on self-reported attitudes, emotions, or behavioural intentions rather than observed behaviour. Intentions may not translate into sustained action, particularly when learners face institutional, economic, or social constraints. Third, the literature uses inconsistent definitions and measures of climate anxiety, hope, agency, and self-efficacy, which makes direct comparison difficult. Climate anxiety, in particular, is sometimes measured as concern and sometimes as impairment or distress. Fourth, many studies are located in Europe, North America, East Asia, or other relatively well-resourced contexts. Evidence from South Asia, Africa, Latin America, Indigenous communities, rural settings, and low-resource educational systems remains comparatively limited. Fifth, the search and selection process has its own limitations. The review relied on Elsevier-related scholarly resources, Google Scholar, and citation tracking rather than a fully comprehensive search across multiple bibliographic databases. Screening was based primarily on titles and abstracts, followed by full-text relevance checking, and was not conducted through independent duplicate screening. Google Scholar retrieval may also be influenced by ranking, indexing, and availability differences. Finally, the inclusion of conceptual papers and previous reviews alongside empirical studies creates heterogeneity in the evidentiary basis. Collectively, these limitations mean that the review should be interpreted as a narrative integrative synthesis rather than as a systematic estimate of intervention effectiveness.

9. Conclusion

The psychological dimensions of climate change education are central to the relationship between learning and action. The reviewed literature suggests that constructive hope, self-efficacy, collective efficacy, and agency are generally associated with climate engagement, whereas anxiety and other negative emotions may either support or inhibit action depending on how they are interpreted, regulated, and connected to opportunities for response.

The evidence does not justify treating knowledge as sufficient for behaviour change, nor assuming that positive emotions are always beneficial and negative emotions are always harmful. Effective climate change education should instead combine accurate scientific knowledge with emotional literacy, realistic hope, participatory learning, collective efficacy, and meaningful opportunities for action.

The field would benefit from stronger methodological consistency, more longitudinal and experimental research, culturally diverse samples, and greater attention to observed behaviour and learner wellbeing. For educators, the central implication is clear: climate change education should prepare learners not only to understand climate change but also to engage with its emotional, ethical, social, and political dimensions in psychologically sustainable ways.

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