

Article

The Double-Edged Sword of Negative Environmental Information: Environmental Worry, Environmental Self-Efficacy and Pro-Environmental Intentions Among Children in Urban China

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Abstract

In today's society, children are increasingly exposed to negative environmental information. How such exposure shapes pro-environmental behavioral intentions matters for the Sustainable Development Goals (SDGs). However, empirical evidence specific to Chinese children remains limited. An explanatory sequential mixed-methods study was conducted with Grade 4 to 6 students in N City, China (survey $n = 253$; focus groups $n = 16$). The survey assessed negative environmental information exposure, environmental worry, environmental self-efficacy, and behavioral intentions, and tested mediation and moderation models. Focus groups were analyzed thematically to refine the mechanisms. Quantitative results revealed a clear “double-edged” pattern: exposure to negative environmental information was positively associated with pro-environmental behavioral intentions via heightened environmental worry, yet negatively associated with intentions via reduced environmental self-efficacy. Moreover, environmental self-efficacy moderated the link between worry and intention. Qualitative findings further corroborated and specified these pathways, indicating that children interpret negative messages through crisis narratives, blame attribution, and scale comparison, whereas actionable scripts and positive feedback help sustain perceived control and support translating worry into intention. Sustainability communication and education should therefore pair risk information with efficacy cues, feasible actions, and meaningful feedback rather than relying solely on threat narratives.

Keywords: negative environmental information exposure; environmental worry; environmental self-efficacy; pro-environmental behavioral intention; environmental communication; environmental education; Chinese urban children



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1. Introduction

In the context of long-term risks from global climate change and ecological degradation, fostering stable, sustainable pro-environmental behaviors among the public has become one critical pathway to achieving Sustainable Development Goals (SDGs) [1–3]. International climate governance and emissions reduction frameworks also consistently emphasize the foundational role of public participation and social action in climate mitigation and adaptation [4,5]. From the perspective of environmental behavior research, pro-environmental behavior is jointly influenced by value orientations, normative cues,

situational constraints, and psychological mechanisms. Therefore, its formation must be understood through the lens of the “information–psychology–action” chain [6,7].

Within the policy and research framework of “Education for Sustainable Development”, children are not only key recipients of environmental education but are also widely recognized as vital future actors and bearers of values in a low-carbon society [8,9]. Research on sustainable development competency and key literacy further indicates that the cultivation of systemic problem understanding, action capacity, and responsibility-awareness must begin in the early period of education and be cumulatively reinforced through curricula, campus practices, and social engagement [10,11]. Recent studies show environmental education shapes sustainable values and attitudes and can advance gender equality, underscoring its role as key context for sustainability-oriented dispositions [12,13].

Concurrently, digital media and platform-based communication have reshaped how environmental information enters daily life. A large number of climate-related disaster images, pollution risks, and ecological damage narratives are appearing with heightened frequency and emotional intensity across news outlets, social platforms, and family conversations. As a result, children are inevitably exposed to environmental information with crisis and catastrophe frameworks earlier and more often [14–16]. Systematic reviews on climate change education reveal that children and adolescents’ learning and action imaginaries extend beyond the classroom. Mediated environments and informal learning experiences are emerging as significant, yet often overlooked, sources of influence [16].

From a sustainable governance perspective, expanding the dissemination of environmental information is intended to enhance risk awareness and promote public engagement [4,5]. However, growing research indicates that negative environmental information does not necessarily lead to positive outcomes. It may also trigger worry, anxiety, helplessness, and avoidance responses, exhibiting a typical double-edged sword effect [17–20]. Particularly for children with immature psychological development, when threatening cues accumulate persistently and accessible coping resources are lacking, information is more likely to transform into emotional burden or defensive responses rather than stable behavioral tendencies [15,21,22]. Therefore, a question highly relevant to sustainable development yet requiring clearer answers: when children are frequently exposed to negative environmental information, are they more likely to be mobilized toward pro-environmental behaviors, or more likely to fall into worry, helplessness, and defensive avoidance [19–21,23]?

Existing research generally holds that emotional responses such as worry or anxiety do not necessarily lead to negative outcomes. Moderate levels of worry may enhance issue salience and motivate action. However, when worry becomes excessive and effective coping resources are lacking, it might shift toward avoidance, numbing, or psychological exhaustion [18,20,24]. A key psychological resource in this context is self-efficacy, an individual’s belief in their capacity to take effective action and make a difference [25,26]. In climate and risk communication research, efficacy information has repeatedly been shown to significantly influence individuals’ processing pathways for threat information, thereby altering their behavioral intentions and public engagement [27–30]. Therefore, integrating environmental worry and environmental self-efficacy into a unified framework helps explain why negative information may produce divergent effects on pro-environmental behavior [30–34].

This issue bears particularly direct practical significance in the Chinese context. On one hand, China is advancing its green and low-carbon transition under the framework of its “dual carbon” goals and ecological civilization development. Relevant policy documents emphasize embedding green and low-carbon concepts and ecological civilization education into the national education system and campus practices [35,36]. On the other

hand, implementing education for sustainable development at the school level still faces challenges related to curriculum structure, resource allocation, and an activity-centric approach. A policy-practice gap may exist between school environmental education and children's daily life experiences [37–39]. Related work also highlights that environmental education is intertwined with social position and empowerment processes, suggesting that sustainability education may operate through differentiated everyday contexts and responsibilities [13]. Simultaneously, short videos and social media platforms expose children to information about the environmental crisis beyond the classroom, creating a media environment where informal learning coexists with emotional information input. This may alter the operational mechanisms and risk boundaries of traditional environmental education [14,16,40]. Therefore, examining the mechanisms through which exposure to negative environmental information influences pro-environmental behavioral intentions among Chinese urban children holds not only theoretical explanatory value but also direct implications for optimizing the practice of sustainability education under mediated conditions [11,16,37].

With this in mind, this paper concentrates on Chinese urban children and aims to answer the following main question: How does exposure to negative environmental information influence pro-environmental behavioral intentions among Chinese urban children? Whether and how environmental worry and environmental self-efficacy play a mediating role? Do efficacy resources moderate the key pathway from worry to action? To comprehensively understand this process, this study adopts a mixed-methods research approach [31], quantitatively examining variable relationships while supplementing with children's local narratives on their understanding of environmental information, emotional experiences, and action imagination.

This study makes three main contributions. First, it introduces the media dimension of exposure to negative environmental information into research on children's sustainable behaviors, addressing new challenges in sustainability education under digital communication conditions. Second, it places environmental worry and self-efficacy within a unified explanatory framework, revealing how negative information can trigger both mobilization and erosion. Third, by focusing on urban Chinese children, it provides empirical evidence from a non-Western context to the international literature and offers more actionable insights for green low-carbon education and risk communication practices.

2. Literature Review

2.1. Exposure to Negative Environmental Information: From Information Contact to Emotional Input

Exposure to negative environmental information can be understood as the frequency and intensity with which individuals encounter environmental narratives centered on risk, loss, and urgency through news, social media, or educational content [14,40]. Studies show that threat information does not equal knowledge, it tends to elicit higher levels of emotional arousal and perceptual processing, hence resembling a sustained "emotional input" [17,40,41]. Importantly, environmental worry is conceptually distinct from fear, which typically reflects an acute response to an immediate threat cue. From a perspective of risk communication, both classic theory about fear appeals as well as threat processing show that it is only when people at once judge 'threat severity' in combination with their 'coping capacity', following reception of threat information, that this threat information can lead to behavior change [30,42–44].

The Extended Parallel Process Model suggests that people in the high threat perception group separate into danger control (taking action) and fear control (denial, avoidance, numbing), with the difference lying in the degree of effectiveness evaluation [30]. Later

meta-analyses have also shown that fear appeals can, on average, improve attitudes and behavioral intentions. However, its effect depends heavily on whether the performance information is sufficient and whether the individual has a feasible action [41,43]. Similarly, protection motivation theory states that a combination of threat and coping appraisals would influence the strength and nature of intention [32,33]. Therefore, for children, the impact of exposure to negative environmental information cannot be understood solely in terms of knowing more; emotional responses and efficacy resources must also be incorporated into the mechanism analysis [21,22,24,27].

In the study of climate communication, although emotional pictures or catastrophic stories can increase attentiveness and perceived risks, they may also reduce feelings of hope and perceived action feasibility [14,28]. Additionally, psychological distance and perceptibility of climate problems affect whether one perceives threat relevance and actionability, thereby influencing the likelihood of translating information into action [45–49]. This suggests, however, that investigating the effects of negative environmental information exposure within a mediated setting must be considered as an input structure and not simply as a proxy variable for environmental education provision [16,42].

2.2. Environmental Worry: Constructive Mobilization or Psychological Burden

Environmental worry generally refers to sustained attention and worries about ecological degradation or environmental risks. Related terms such as eco-anxiety and climate anxiety, meanwhile, focus on emotional distress, experiences of helplessness, and the potential risk of functional impairment [17,22,23]. Recent cross-national research indicates that many children and adolescents exhibit significant worry and uncertainty about the future when confronted with climate risks, linking this experience to perceptions of inadequate societal action [19,21]. Consequently, environmental worry can serve as a motivator for action but may also evolve into a psychological burden under high-stress conditions [17,18,20,24]. Accordingly, in the present study, we focus on environmental worry as expressed in everyday language among children, rather than treating it as clinical-level eco-anxiety.

In terms of conceptualization and measurement development, the creation of climate anxiety scales has moved empirical work forward in this area as well as pointing out that further differentiation is needed between states of transient worry and ongoing unease [22,50]. These multidimensional measures also suggest that rumination, affective distress, functional impairment, and action orientation may represent partially distinct components with different implications for behavioral intentions [51,52]. Meanwhile research with adolescents and children highlights the importance of focusing on environmental worry conveyed in everyday speech, placing them in context by relating their consequences to hope, meaning, and coping resources [24,53–55].

From a mechanistic perspective, multiple studies reveal a coexisting relationship between “mobilization” and “erosion” in the context of worry and pro-environmental behavior. Some research indicates that worry can enhance policy support and pro-environmental actions, while other studies suggest worry may weaken action propensity through pathways of helplessness, avoidance, or psychological exhaustion [17,20,21]. Among children and adolescents, whether emotions translate into action often depends on whether they are accompanied by hope, a sense of meaning, and feasible coping resources [24,29,54]. Therefore, in the pathway from negative information exposure to behavioral intention, environmental worry serves as a key mediating variable, but its effect direction depends on efficacy resources and the coping context [27,30].

2.3. Self-Efficacy: A Key Psychological Resource for Children's Pro-Environmental Actions

Self-efficacy, a core concept in social cognitive theory, emphasizes individuals' beliefs in their ability to perform specific behaviors and achieve goals [25,26]. In pro-environmental behavior research, behavioral control beliefs, which are highly correlated with self-efficacy, are established antecedents of behavioral intention. They promote sustained action by enhancing problem-solving confidence and reducing perceived action costs [56–59]. Empirical studies across diverse samples consistently reveal a stable association between environmental self-efficacy and pro-environmental behaviors. This relationship may be further strengthened via pathways involving attitudes, responsibility attribution, and emotional experiences [60–62].

In climate and risk communication, efficacy messages have been shown to significantly alter the emotional structure evoked by threat information, increasing action intentions or public participation tendencies [27–29,63]. For instance, communication emphasizing feasible actions and collective efficacy is more likely to foster hope and constructive engagement, whereas messages solely highlighting catastrophic consequences are more likely to elicit helplessness or defensive responses [14,28,29]. For children and adolescents, self-efficacy exhibits stronger developmental characteristics, often forming through family support, school practices, visible feedback, peer norms, and collective action experiences [16,38,39]. Furthermore, research indicates that psychological orientations such as emotional connection to nature and nature-relatedness, along with experiences of urban nature contact, frequently accompany the development of environmental worry, pro-environmental behavior, and related competencies. This provides a complementary perspective for understanding the resource foundations of children's pro-environmental actions [64–67].

Consistent with this, systematic reviews and meta-analyses on pro-environmental behaviors among children and adolescents indicate that education and interventions generally enhance knowledge, attitudes, and behaviors, while significant heterogeneity in effects suggests that emotional and efficacy conditions may determine whether information or education translates into sustained action [68–70]. Therefore, incorporating environmental self-efficacy into mechanistic models not only addresses theoretical explanatory needs but also aligns closely with the practical objectives of education for sustainable development [8,9].

2.4. Integrated Explanation of the Double-Edged Sword Mechanism: Coupling of Threat, Emotion, and Efficacy

Drawing on both the literature of risk communication and climate communication, another, more explanatory interpretation, conceptualizes negative environmental information as threat input and considers environmental worry and self-efficacy as central psychological mediators of its consequences [27,30,32–34]. If children become environmentally worried as a result of their exposure to negative information, this worry can increase issue salience and drive moral mobilization, thus increasing the intention to engage in pro-environmental behavior [17,21,29]. If at the same time worry is combined with a lack of self-efficacy, however, people will be prone to follow a fear-control route (EPPM) or defense mechanism, in the form of avoidance, denial and/or numbing that in turn undermines behavioral intention [30,43–45].

Empirical research supports this explanation of emotion-efficacy coupling. Prospective emotions like hope and helplessness have been shown to influence individuals' imagination and commitment to action, while efficacy beliefs are crucial in determining whether hope translates into action [27,29]. Furthermore, behavioral science and environmental psychology research indicate that heightened risk awareness alone is insufficient to translate into effective action automatically; normative cues, perceived behavioral control, and the

availability of feasible pathways are equally critical [56,57,62]. Therefore, integrating the mobilization pathway and erosion pathway within a unified framework better captures the complex effects of negative information in real-world media environments [20,40,45].

2.5. Research Gaps in the Chinese Context: The Intersection of Green Low-Carbon Education and Mediated Risk Input

China's policy framework consistently emphasizes green and low-carbon transformation alongside ecological civilization education, incorporating green concepts into the national education system and campus practices [35,36]. Concurrently, research indicates that implementing education for sustainable development at the school level may be constrained by factors such as curriculum structure, exam-oriented approaches, activity-based implementation, and resource disparities, leading to unstable knowledge acquisition and action conversion [37–39]. Against this backdrop, digital media has become a primary channel for children to engage with environmental issues. Risk information continuously infiltrates daily life through emotionalized channels, jointly shaping children's environmental emotions and behavioral imagination alongside formal schooling [21,40,42].

Internationally, research on children and adolescents' environmental emotions, eco-anxiety, and behavioral intentions has grown rapidly. However, mechanism testing within the Chinese context remains relatively limited, particularly in the absence of empirical studies that integrate media exposure, emotional response, efficacy resources, and behavioral intentions into a unified model [21,68]. Therefore, examining the double-edged sword mechanism among urban Chinese children can enrich the contextual diversity of the international literature while providing schools and media platforms with more precise risk boundaries and intervention strategies for sustainable communication practices [8,37].

2.6. Research Hypotheses

Based on the above discussion, this study proposes the following hypotheses:

Given the cross-sectional nature of the survey, the following hypotheses are formulated in terms of expected associations and indirect associations. Building on efficacy-based risk communication and social-cognitive accounts, repeated exposure to threat-focused environmental information may heighten worry while simultaneously undermining perceived controllability and coping capability, particularly when messages lack clear and feasible action options for children. This implies two competing indirect pathways linking exposure to pro-environmental intention: a mobilizing pathway via increased worry and an inhibiting pathway via reduced environmental self-efficacy.

H1. *Higher levels of children's exposure to negative environmental information are expected to be positively associated with environmental worry.*

H2. *Higher levels of children's exposure to negative environmental information are expected to be negatively associated with environmental self-efficacy.*

H3. *Children's exposure to negative environmental information is expected to be indirectly associated with higher pro-environmental behavioral intention via higher environmental worry.*

H4. *Children's exposure to negative environmental information is expected to be indirectly associated with lower pro-environmental behavioral intention via lower environmental self-efficacy.*

H5. *Environmental self-efficacy is expected to moderate the association between environmental worry and pro-environmental behavioral intention, such that the positive association is stronger when self-efficacy is high and weaker when self-efficacy is low.*

Figure 1 presents the hypothesized conceptual model linking negative environmental information exposure, environmental worry, environmental self-efficacy, and pro-environmental behavioral intention, including the two indirect pathways and the moderating role of self-efficacy.

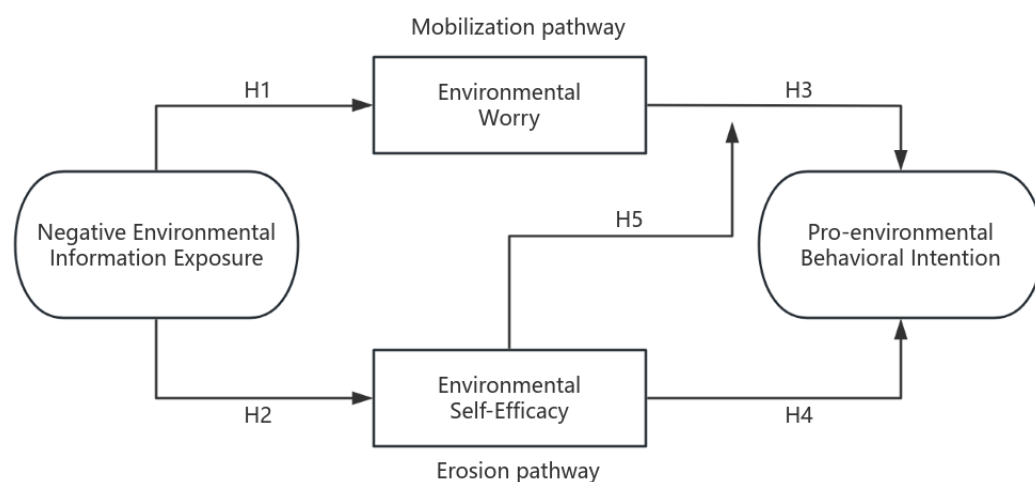


Figure 1. Hypothesized Conceptual Model.

3. Research Design and Method

3.1. Research Design

This study employs an explanatory sequential mixed-methods design, with the quantitative phase preceding the qualitative one to examine the proposed associations and interpret findings in an explanatory manner [31]. First, a questionnaire survey tested H1–H5. Subsequently, focus group interviews were conducted based on quantitative results to explain and refine key pathways in the statistical model.

The quantitative phase measured primary students' exposure to negative environmental information, environmental worry, environmental self-efficacy, and pro-environmental behavioral intention using a self-developed questionnaire and adapted scales. Descriptive statistics, reliability testing, correlation analysis, and mediation/moderation effect tests were conducted using SPSS 26.0. In the qualitative phase, participants were grouped into typical worry $\times$ efficacy combinations based on survey scores, followed by focus-group interviews. Using NVivo 14, we conducted coding and thematic analysis to capture qualitative evidence of worry, helplessness/empowerment, and perceived action constraints, which informed interpretation of the mobilization and erosion pathways.

3.2. Research Setting and Sample

The quantitative survey was conducted in two public elementary schools located in urban communities in City N, eastern China, from August to September 2025. Both schools routinely delivered school-based environmental education and related practical activities. The target population comprised students in Grades 4–6, who generally have sufficient reading comprehension and have been exposed to environmental education at school as well as digital media in daily life. Because both schools had active environmental education practices, students' baseline awareness and efficacy may be higher than in the general population, which should be considered when interpreting generalizability.

Questionnaires were administered by class. In each school, one class was selected from each grade (Grades 4–6). In urban Chinese primary schools, class assignment is commonly arranged to keep class sizes similar. It is also commonly arranged to keep the gender composition roughly balanced across classes. The two participating schools followed

this common practice, which helped reduce between-class differences in composition. Questionnaires were administered by class.

A total of 279 questionnaires were distributed. After data screening, 26 were excluded due to substantial incompleteness or low-quality response patterns (e.g., missing data in core scales or straight-line responding), yielding 253 valid cases for quantitative analyses. The final analytic dataset contained no missing values on the study variables.

Prior to formal administration, experts in environmental education and developmental psychology reviewed all items to ensure content validity. We then conducted a pre-test with 18 students (six per grade) from the participating schools, and refined item wording through brief cognitive interviews to ensure age-appropriate comprehension and to avoid inducing excessive fear. Pre-test participants were excluded from the final analytic sample to prevent repeated exposure.

Following the quantitative survey, a subset of students was invited from the questionnaire sample to participate in focus group interviews. To capture diverse experiences relevant to the proposed mediation mechanisms, the study employed maximum difference sampling primarily based on environmental worry and environmental self-efficacy. Specifically, students were ranked on each measure, and “high” and “low” scores were defined using distribution-based cut-off scores, with the high group drawn from the highest one-third of the sample and the low group drawn from the lowest one-third. The recruitment aimed to include contrasting profiles across these two measures (high versus low environmental worry; high versus low environmental self-efficacy). During recruitment, exposure to negative environmental information was used as a balancing consideration to ensure that participants within each profile did not all come from a single exposure level. Pro-environmental behavioral intention was not used as a selection criterion to avoid sampling on downstream outcomes, but participants were checked to ensure coverage of both relatively higher and lower intention levels. Within each profile, students were invited in a random order until the planned group composition was reached, and participation was voluntary. Each group comprised 4–6 participants, with interviews lasting approximately 20–30 min. Three sessions were organized, involving 16 participants in total. All interviews were conducted in quiet classrooms at the school and facilitated by researchers trained in ethical research with children.

3.3. Scales and Measurement

3.3.1. Negative Environmental Information Exposure (NEIE)

Negative Environmental Information Exposure was defined as the frequency and perceived impact of negative environmental information encountered by children in the past month across multiple channels (e.g., television, online news/short videos, social media, school-based materials, and family/peer conversations). “Negative environmental information” refers to content emphasizing environmental crises and degradation, catastrophic consequences, conspicuous waste/high-consumption lifestyles, and societal inaction. The scale items were constructed based on media use and environmental communication research, informed by existing measurement approaches for media use and environmental behavior related to global warming, such as quantifying frequency of obtaining global warming-related information from different media in the past month [55]. The full set of NEIE items is provided in Appendix A.

NEIE was measured using six items (A1–A6) on a 5-point Likert scale (1 = almost never, 5 = very frequently), assessing how often children have encountered negative environmental information in the past month across multiple channels. Examples include: “bad news about environmental pollution and ecological destruction,” “disturbing images or stories of destruction,” “claims that environmental problems are severe and difficult to

solve,” “discussions about resource waste by the wealthy,” and “statements that no one is responsible or nothing can be done.” The scale also contains an overall item measuring the frequency of exposure to information that makes the environment seem deteriorating or dangerous.

The NEIE scale primarily captures exposure frequency across channels (Items A1–A5). Item A6 was included as an overall impression item reflecting children’s general perception that the environment is deteriorating, and the six items were modeled as a unidimensional construct in subsequent analyses.

3.3.2. Environmental Worry

Environmental worry was adapted from Stewart’s Climate Change Worry Scale (CCWS) [71], by rewording climate change-specific items to refer to broader environmental issues (e.g., “I often worry about how environmental problems will affect my future”; “When I think about environmental issues, I find myself worrying for a long time involuntarily”). To avoid pathologizing, the items capture frequent worry and emotional unease only, without referencing clinical anxiety symptoms, consistent with how the “worry” dimension is conceptualized in children’s eco-anxiety research [72].

This variable was measured using five items (B7–B11) on a 5-point agreement scale (1 = Strongly Disagree, 5 = Strongly Agree). Items cover “prospective worries about environmental issues affecting the future,” “persistent worries when thinking about environmental problems,” “recurring thoughts about environmental deterioration/increased extreme weather,” “anxiety about long-term unsolvable problems,” and the overall experience of “unease triggered by environmental issues”.

3.3.3. Environmental Self-Efficacy

Environmental self-efficacy refers to children’s belief in their ability to promote positive environmental change through daily behaviors and collective actions. The scale was based on prior research linking environmental self-efficacy to pro-environmental attitudes and behaviors [73]. It also drew on Zhang and Cao’s SEM study on the psychological mechanisms of environmental education [74]. All items were reworded in child-friendly language.

This variable was measured using five items (C12–C16) on a 5-point agreement scale (1 = Strongly Disagree, 5 = Strongly Agree). Items cover “a sense of ability to take pro-environmental actions,” “a belief that students can make a difference,” “a sense of mastery over feasible eco-friendly practices,” “a belief that persistent actions can influence others,” and an overall efficacy judgment, namely the belief that collective small actions can bring change despite facing grand environmental problems.

3.3.4. Pro-Environmental Behavioral Intention

Pro-environmental behavioral intention referred to children’s subjective intention to engage in environmental protection and related activities within daily contexts. The scale synthesizes existing research on children’s pro-environmental behavioral intention [75,76], refining and simplifying its behavioral items.

This variable was measured using five items (D17–D21) on a 5-point agreement scale (1 = Strongly Disagree, 5 = Strongly Agree). Items cover “daily water and electricity conservation,” “waste sorting and avoiding littering,” “reducing single-use items,” “willingness to participate in school/class environmental activities,” and “willingness to remind and encourage family members or classmates to reduce waste and adopt pro-environmental behavior”.

3.4. Quantitative Data Analysis

This study combined quantitative and qualitative methods. Quantitative data were analyzed using regression and mediation analysis, while qualitative data were analyzed using thematic analysis.

3.4.1. Questionnaire Data Analysis

Questionnaire data were analyzed using SPSS 26.0. Missing values were first addressed, followed by normality tests. Means, standard deviations, and Pearson correlation coefficients were calculated for each variable. Internal consistency was assessed using Cronbach's α , and the dimensional structure was examined using exploratory factor analysis. Mediation and moderation effects were tested using SPSS's PROCESS macro [77].

For H1–H2, separate linear regression analyses were conducted to examine main effects, with environmental worry (H1) and environmental self-efficacy (H2) as dependent variables, exposure to negative environmental information as the independent variable, gender and grade as controls.

For H3–H4, PROCESS Model 4 was employed for a test of the mediation effect. Negative environmental information exposure served as the independent variable, pro-environmental behavioral intention as the dependent variable, with gender and grade controlled. Environmental worry and environmental self-efficacy were included as mediating variables. Bootstrap resampling (5000 iterations) estimated indirect effects, and the Percentile method calculated 95% confidence intervals to compare the magnitude of indirect effects between the mobilization pathway and the erosion pathway.

For H5, hierarchical regression analysis was employed, controlling for gender and grade variables. Environmental self-efficacy served as a moderate variable in the environmental worry-pro-environmental behavioral intention pathway. The significance of the “worry-self-efficacy” interaction term was tested, followed by a simple-slope analysis under high and low-efficacy conditions. This examined whether environmental worry was more readily translated into action under high-efficacy conditions, whereas it might weaken behavioral intention under low-efficacy conditions.

3.4.2. Power Analysis

Given that the final sample size was fixed by field access ($n = 253$), we conducted a sensitivity power analysis for multiple linear regression using the overall model F-test (two-tailed, $\alpha = 0.05$). For model specifications comparable to those used in this study (i.e., three to six predictors, including grade level and gender as covariates), the available sample provides 80% power to detect small effects, with the minimum detectable Cohen's f^2 ranging from 0.044 to 0.055 (Table 1). Using the observed effect sizes from the main regression models, the achieved power ranged from 0.86 to >0.99 , with the lowest achieved power observed for the environmental self-efficacy model ($f^2 = 0.051$). Overall, these results suggest that the quantitative analyses are adequately powered to detect effects of the magnitude observed in this study, while very small effects may remain difficult to detect. Following Cohen's conventional benchmarks ($f^2 = 0.02$ small, 0.15 medium, 0.35 large), the present power analysis pertains to the variance explained by the full predictor set rather than power for any single regression coefficient.

Table 1. Sensitivity and achieved power for the main regression models ($n = 253$).

Outcome Variable	Predictor Set	Sample Size	Number of Predictors	Observed R^2	Observed Cohen's f^2	Achieved Power ($\alpha = 0.05$)	Minimum Detectable Cohen's f^2 (80% Power)
Environmental Worry	Negative Environmental Information Exposure; Grade level; Gender	253	3	0.166	0.199	>0.99	0.044
Environmental Self-Efficacy	Negative Environmental Information Exposure; Grade level; Gender	253	3	0.048	0.051	0.860	0.044
Pro-environmental Behavioral Intention	Negative Environmental Information Exposure; Environmental Worry; Environmental Self-Efficacy; Grade level; Gender	253	5	0.253	0.339	>0.99	0.052
Pro-environmental Behavioral Intention	Negative Environmental Information Exposure; Environmental Worry; Environmental Self-Efficacy; Environmental Worry $\times$ Environmental Self-Efficacy; Grade level; Gender	253	6	0.257	0.346	>0.99	0.055

3.5. Qualitative Phase: Focus Group and NVivo Analysis

The focus group interview guide covered three themes: (a) Information Experiences (how children encounter environmental issues in daily life; the most memorable content and why); (b) Emotional Experiences (dominant emotions and triggers, including worry, irritation, fear, anger, and helplessness; the tension between “wanting to do something” and “feeling it is futile”); and (c) Efficacy and Action (judgments about the feasibility and significance of actions, and differences in how environmental behaviors are understood at school versus at home).

The focus group ran from September to October 2025. All interviews were audio-recorded and transcribed after obtaining informed consent from parents and children. Transcripts were imported into NVivo 14 for data management and coding retrieval. Qualitative analysis employed a theory-sensitive thematic approach, using core concepts from the quantitative model as an initial analytic framework (e.g., exposure to negative environmental information”, “environmental worry”, “environmental self-efficacy”, “pro-environmental behavioral intention”). This framework served to enhance sensitivity in identifying key segments while simultaneously allowing incorporation of recurrent experiential elements not fully captured by preset variables during coding (e.g., the designation of structural injustice, the sense of offset to the effect of the action, emotional fatigue of information, etc.). Qualitative analysis used a core-concept-guided thematic approach. The core concepts from the quantitative model (negative environmental information exposure, environmental worry, environmental self-efficacy, and pro-environmental behavioral intention) were used as an initial analytic framework to increase sensitivity to salient segments. At the same time, coding remained allow incorporation of recurrent experiential elements that were not fully covered by the preset variables, such as references to perceived structural injustice, a perceived “offsetting” of action effects, and information-related emotional fatigue.

The coding process involved three interconnected stages. First, during open coding, passages were annotated segment by segment based on information sources, content, emotional experiences, efficacy assessments, and behavioral intentions. This step formed initial nodes and coding memos to define conceptual boundaries. Second, axial coding was conducted. Through constant comparison, semantically similar nodes were merged, differentiated, or organized into hierarchies. This clarified parent–child node relationships

and established interpretive links between these nodes and the quantitative model's mobilization/erosion pathways. Finally, thematic induction was performed. Using the resulting node structure, key themes and typical scenarios were distilled to explain "how worry translates into action" and "how efficacy is undermined, thereby inhibiting action." This formed the thematic framework for presenting the results.

Considering that the qualitative part of this study served as interpretive supplementation, in order to reduce the interpretation bias of a single researcher, this study introduced a peer review process after completing the initial coding, and another researcher reviewed the randomly selected text segments and node structures, focusing on verifying consistency in thematic boundaries, categorization logic, and representative evidence. Consensus was reached through discussion on areas of disagreement.

3.6. Research Ethics

This study strictly followed ethical standards for research involving children. All questionnaires and interviews procedures were conducted with informed consent from parents and children. Questionnaires were anonymous, and data were used only for academic purposes. Focus groups were held in safe and familiar spaces within the school. Moderators were instructed to refrain from using overly catastrophic language and instead to incorporate affirming messages during discussions (e.g., "Many people are working to solve environmental problems" and "Small actions matter") to reduce potential emotional burden. For children exhibiting significant anxiety or emotional distress during an interview, the research team promptly informed parents and the responsible teachers and recommended further psychological support when needed.

4. Quantitative Findings

This chapter presents a quantitative analysis of the questionnaire survey results. According to the scoring rules, negative environmental information exposure was derived from the mean score of items A1–A6, environmental worry from items B7–B11, environmental self-efficacy from items C12–C16, and pro-environmental behavioral intention from items D17–D21. Statistical analyses included descriptive statistics and normality tests, reliability analysis and exploratory factor analysis, correlation analysis, tests of H1 through H4 using regression and mediation analyses with grade and gender as control variables, and an examination of the moderating effect posited in H5, followed by simple slope analysis.

4.1. Sample Characteristics and Descriptive Statistics

The survey yielded 253 valid samples. Gender and grade distribution are shown in Table 2. Overall, male students slightly outnumbered female students, with relatively balanced sample sizes across grades 4 to 6.

Table 2. Sample Characteristics.

Variable	Option	Frequency	Percentage (%)	Cumulative Percentage (%)
Grade	Grade 4	92	36.36	36.36
	5th Grade	84	33.2	69.57
	6th Grade	77	30.43	100
Gender	Male	133	52.57	52.57
	Female	120	47.43	100
Total		253	100	100

The means, standard deviations, skewness, and kurtosis of the four core variables are shown in Table 3. All kurtosis values are below 3, indicating a flat distribution that

approximates normality. Skewness values are all close to zero, suggesting a symmetrical distribution that also approximates normality. Both metrics fall within the acceptable ranges commonly used in regression and Bootstrap inference, supporting subsequent correlation, regression and mediation analyses. No missing values were observed in the data.

Table 3. Descriptive Statistics and Normality Indicators.

Variable	Sample Size	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kernel
Negative Environmental Information Exposure	253	1.170	4.830	2.299	0.872	1.261	0.260
Environmental Worry	253	1.200	5.000	2.208	0.866	1.385	0.689
Environmental Self-Efficacy	253	1.000	5.000	3.473	1.124	−0.322	−1.255
Intention to Engage in Pro-Environmental Behavior	253	1.000	5.000	3.235	1.087	−0.486	−1.197

4.2. Scale Reliability and Validity Testing

4.2.1. Internal Consistency Reliability

All four subscales demonstrated good internal consistency. Cronbach's α coefficients were as follows: Negative Environmental Information Exposure 0.872, Environmental Worry 0.855, Environmental Self-Efficacy 0.913, and Pro-Environmental Behavioral Intention 0.91. The adjusted item-total correlations were generally within an acceptable range, indicating that each item effectively contributed to the measurement of its corresponding concepts.

4.2.2. Validity Analysis

Exploratory factor analysis was conducted on all 21 items. As shown in Table 4, KMO = 0.885, greater than 0.6, meeting the prerequisites for factor analysis, indicating that the data can be used for factor analysis research. Additionally, the data passed Bartlett's test of sphericity ($p < 0.05$), confirming its suitability for factor analysis. Four factors were extracted based on eigenvalues greater than 1. After rotation, these factors cumulatively explained 68.281% of the total variance, aligning with the four theoretical concepts of the study. Item loadings on the expected factors were high, and commonality values fell within a reasonable range, supporting the construct validity of the scale.

Table 4. KMO and Bartlett's Tests.

KMO Value		0.885
Bartlett's Sphericity Test	Approximate Chi-Square	3020.072
	df	210
	p-value	<0.001

To further validate the measurement structure, confirmatory factor analysis was conducted on the four-factor model (negative environmental information exposure, environmental worry, environmental self-efficacy, and pro-environmental behavioral intention). The model showed good fit ($\chi^2 = 240.627$, $df = 183$, $\chi^2/df = 1.315$, CFI = 0.980, TLI = 0.977, IFI = 0.980, NFI = 0.923, RFI = 0.925, GFI = 0.921, RMSEA = 0.035), See Table 5. Standardized factor loadings were all above 0.90 and significant. Convergent validity was supported (average variance extracted = 0.534–0.679; composite reliability = 0.856–0.914), and discrim-

inant validity was acceptable as the square roots of average variance extracted (0.730–0.824) exceeded inter-construct correlations.

Table 5. Model Fit of Confirmatory Factor Analysis.

Model Fit	CMIN	DF	CMIN/DF	NFI	RFI	IFI	TLI	CFI	GFI	RMSEA
Fit Results	240.627	183	1.315	0.923	0.925	0.980	0.977	0.980	0.921	0.035
Fit Indices			<3	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	<0.08

4.2.3. Additional Analysis

To explore whether the observed patterns could be attributed to grade composition (rather than psychological heterogeneity), we conducted an exploratory k-prototype cluster analysis using the four focal variables, See Table 6.

Table 6. Analysis of Variance for Cluster Categories.

	Variance Analysis of Cluster Categories and Comparison of Differences (Mean $\pm$ Standard Deviation)			F	p
	Cluster_1 (n = 113)	Cluster_2 (n = 86)	Cluster_3 (n = 54)		
Negative environmental information exposure	1.93 $\pm$ 0.44	1.93 $\pm$ 0.38	3.67 $\pm$ 0.73	254.675	0.000 *
Environmental Worry	1.92 $\pm$ 0.57	1.95 $\pm$ 0.50	3.22 $\pm$ 1.07	74.643	0.000 *
Environmental Self-Efficacy	4.01 $\pm$ 0.84	3.09 $\pm$ 1.08	2.95 $\pm$ 1.23	29.080	0.000 *
Intention to Engage in Pro-Environmental Behavior	3.95 $\pm$ 0.31	1.84 $\pm$ 0.39	3.96 $\pm$ 0.62	730.785	0.000 *

* $p < 0.01$.

Cross-tabulation showed no significant differences in grade distribution across clusters ($\chi^2 = 5.598$, $p = 0.231$), and the three clusters (cluster_1: $n = 113$; cluster_2: $n = 86$; cluster_3: $n = 54$) were relatively evenly represented across Grades 4–6. This suggests that grade is not a key factor driving cluster membership. One-way analyses of variance further indicated that all four variables differed significantly across the three clusters (all $p < 0.001$). Specifically, negative environmental information exposure and environmental worry were highest in cluster_3 ($M = 3.67 \pm 0.73$; $M = 3.22 \pm 1.07$), whereas cluster_1 and cluster_2 showed similarly low levels (approximately $M = 1.92$ – 1.95). Environmental self-efficacy was highest in cluster_1 ($M = 4.01 \pm 0.84$) and lower in cluster_2 and cluster_3 ($M = 3.09 \pm 1.08$; $M = 2.95 \pm 1.23$). Pro-environmental behavioral intention was high and comparable in cluster_1 and cluster_3 ($M = 3.95 \pm 0.31$; $M = 3.96 \pm 0.62$), but substantially lower in cluster_2 ($M = 1.84 \pm 0.39$). Overall, the cluster differences concentrate on environmental psychological and behavioral variables rather than grade composition, which reduces concerns that the main findings are an artefact of grade-based sampling.

4.3. Correlation Analysis

Correlation analysis was employed to examine the relationships among pro-environmental behavioral intention and three variables: exposure to negative environmental information, environmental worry, and environmental self-efficacy. Pearson's correlation coefficient was used to indicate the strength of these relationships. As shown in Table 7, exposure to negative environmental information was significantly positively correlated with environmental worry and significantly negatively correlated with environmental self-efficacy.

Environmental worry was significantly positively correlated with behavioral intention, and environmental self-efficacy was also significantly positively correlated with behavioral intention. The directions of correlations are consistent with the theoretical predictions of H1–H4, providing preliminary support for subsequent regression and mediation tests.

Table 7. Pearson Correlation Coefficients.

	Mean	Standard Deviation	Exposure to Negative Environmental Information	Environmental Worry	Environmental Self-Efficacy	Pro-Environmental Behavioral Intention
Negative environmental information exposure	2.299	0.872	1			
Environmental Worry	2.208	0.866	0.405	1		
Environmental Self-Efficacy	3.473	1.124	−0.207	−0.101	1	
Intention to Engage in Pro-Environmental Behavior	3.235	1.087	0.306	0.240	0.288	1

4.4. Hypothesis Testing: Regression, Mediation, and Moderation Analysis

This section tests H1–H5 and discusses the findings in the order of main effect, mediating mechanism, and regulatory effect. To balance comparability and interpretability, the linear regression analyses for H1–H2 report both unstandardized coefficients (B) and standardized coefficients (β). Mediation and moderation analysis, based on PROCESS outputs, report unstandardized effect values (B) and their Bootstrap confidence intervals. Unless otherwise specified, all models control for gender and grade variables. Indirect effects are estimated using 5000 Bootstrap resamples, with 95% confidence intervals calculated via the Percentile method.

4.4.1. Main Effects Tests

After controlling for grade and gender, Table 8 shows that the regression coefficient for exposure to negative environmental information on environmental worry is significantly positive ($B = 0.403$, $\beta = 0.405$, $p < 0.001$), supporting H1. Table 9 shows that the regression coefficient for negative environmental information exposure on environmental self-efficacy is significantly negative ($B = -0.262$, $\beta = -0.203$, $p = 0.001$), supporting H2. Both results indicate that negative environmental information exposure is significantly positively correlated with environmental worry and significantly negatively correlated with environmental self-efficacy.

Table 8. Linear Regression Analysis of Negative Environmental Information Exposure–Environmental Worry Linear.

	Unstandardized Coefficient		Standardized Coefficient	t	p	Collinearity Diagnosis	
	B	Standard Error	Beta			VIF	Tolerance
Constant	1.398	0.356	-	3.924	0.000 *	-	-
Grade	−0.038	0.062	−0.036	−0.608	0.543	1.02	0.981
Gender	0.048	0.101	0.028	0.473	0.637	1.021	0.979
Negative Environmental Information Exposure	0.403	0.058	0.405	6.994	0.000 *	1.002	0.998
R ²	0.166						
Adjusted R ²	0.156						
F	F(3, 249)=16.493, $p = 0.000$						
D-W value	2.012						

Note: Dependent variable = Environmental Worry * $p < 0.01$.

Table 9. Linear Regression Analysis of Negative Environmental Information Exposure-Environmental Self-Efficacy.

	Unstandardized Coefficients		Standardized Coefficient	t	p	Collinearity Diagnosis	
	B	Standard Error	Beta			VIF	Tolerance
Constant	3.659	0.494	-	7.409	0.000 *	-	-
Grade	0.041	0.086	0.030	0.475	0.635	1.020	0.981
Gender	0.145	0.140	0.065	1.036	0.301	1.021	0.979
Negative environmental information exposure	−0.262	0.080	−0.203	−3.279	0.001 *	1.002	0.998
R ²	0.048						
Adjusted R ²	0.037						
F	F (3, 249) = 4.212, $p = 0.006$						
D-W value	2.043						

Note: Dependent variable = Environmental self-efficacy * $p < 0.01$.

4.4.2. Mediating Effect Test

Using hierarchical regression analysis, the results (Table 10) indicate that after controlling for grade level and gender, exposure to negative environmental information significantly and positively correlates with pro-environmental behavioral intentions ($B = 0.388$, $t = 5.193$, $p < 0.01$). Environmental worry also exhibits a significant positive predictive effect ($B = 0.403$, $t = 6.994$, $p < 0.01$). Conversely, exposure to negative environmental information significantly and negatively predicts environmental self-efficacy ($B = -0.262$, $t = -3.279$, $p < 0.01$), while environmental worry significantly and positively predicts environmental self-efficacy ($B = 0.403$, $t = 6.994$, $p < 0.01$), while significantly and negatively predicting environmental self-efficacy ($B = -0.262$, $t = -3.279$, $p < 0.01$). This indicates that increased exposure to negative environmental information elevates individuals' levels of environmental worry while simultaneously reducing their environmental self-efficacy.

In the regression model including the mediators, environmental worry was positively associated with pro-environmental behavioral intention ($B = 0.178$, $t = 2.351$, $p < 0.05$), and environmental self-efficacy was also positively associated with pro-environmental behavioral intention ($B = 0.354$, $t = 6.484$, $p < 0.01$). The association between negative environmental information exposure and pro-environmental behavioral intention remained significant after accounting for the mediators ($B = 0.409$, $t = 5.350$, $p < 0.01$). Model performance improved, with adjusted R^2 increasing from 0.101 to 0.238 and $F(5, 247) = 16.760$ ($p < 0.01$), suggesting a better fit to the observed data.

The study further employed a bootstrap procedure (5000 resamples) to test parallel indirect associations between exposure to negative environmental information and pro-environmental behavioral intention via environmental worry and environmental self-efficacy. As shown in Table 11, the indirect association through environmental worry was significantly positive (effect size = 0.072, $SE = 0.029$, 95% $CI = [0.021, 0.133]$), indicating that higher exposure was associated with higher environmental worry, which in turn was associated with higher pro-environmental behavioral intention. In contrast, the indirect association through environmental self-efficacy was significantly negative (effect size = -0.093 , $SE = 0.038$, 95% $CI = [-0.177, -0.029]$), suggesting that higher exposure was associated with lower environmental self-efficacy, which was associated with lower pro-environmental behavioral intention. Given the cross-sectional design, these results are

interpreted as associational patterns consistent with the proposed dual-pathway mechanism, rather than evidence of causality.

Table 10. Mediation Effect Model Testing.

	Pro-Environmental Behavioral Intention	Environmental Worry	Environmental Self-Efficacy	Pro-Environmental Behavioral Intention
Constant	2.319 ** (5.023)	1.398 ** (3.924)	3.659 ** (7.409)	0.777 (1.611)
Grade	−0.078 (−0.966)	−0.038 (−0.608)	0.041 (0.475)	−0.085 (−1.152)
Gender	0.277 * (2.112)	0.048 (0.473)	0.145 (1.036)	0.217 (1.794)
Negative Environmental Information Exposure	0.388 ** (5.193)	0.403 ** (6.994)	−0.262 ** (−3.279)	0.409 ** (5.350)
Environmental Worry				0.178 * (2.351)
Environmental Self-Efficacy				0.354 ** (6.484)
Sample Size	253	253	253	253
R ²	0.111	0.166	0.048	0.253
Adjusted R ²	0.101	0.156	0.037	0.238
F value	F(3, 249) = 10.400, <i>p</i> = 0.000	F(3, 249) = 16.493, <i>p</i> = 0.000	F(3, 249) = 4.212, <i>p</i> = 0.006	F(5, 247) = 16.760, <i>p</i> = 0.000

* *p* < 0.05, ** *p* < 0.01 (Values in parentheses indicate t-statistics).

Table 11. Bootstrap Mediation Effect Test.

Item	Significance	Effect Size	Standard Error (SE)	95% CI	
				Lower Bound	Upper Bound
Negative Environmental Information Exposure → Pro-environmental behavioral intention	Total Effect	0.388	0.075	0.241	0.535
Negative Environmental Information Exposure → Pro-Environmental Behavioral Intentions	Direct Effect	0.409	0.076	0.258	0.559
Negative Environmental Information Exposure → Environmental Worry → Pro-Environmental Behavioral Intention	Indirect effect	0.072	0.029	0.021	0.133
Exposure to negative environmental information → Environmental self-efficacy → Pro-environmental behavioral intention	Indirect effect	−0.093	0.038	−0.177	−0.029

Note: “→” denotes the hypothesized causal path.

Overall, negative environmental information exposure showed two distinct indirect associations with pro-environmental behavioral intention: a positive indirect association via environmental worry and a negative indirect association via environmental self-efficacy. Together, these findings are consistent with the proposed dual-pathway account and support H3 and H4 in an associational sense.

4.4.3. Moderating Effect of Environmental Self-Efficacy

Using pro-environmental behavioral intention as the dependent variable, hierarchical regression was conducted to examine whether the association between environmental worry and pro-environmental behavioral intention varied as a function of environmental self-efficacy. As shown in Table 12, Model 1 showed that environmental worry was positively associated with pro-environmental behavioral intention ($B = 0.298$, $t = 3.885$, $p < 0.01$), whereas grade and gender were not significant. Model 2 added environmental self-efficacy and indicated that both environmental worry ($B = 0.337$, $t = 4.609$, $p < 0.01$) and environmental self-efficacy ($B = 0.301$, $t = 5.329$, $p < 0.01$) were positively associated with pro-environmental behavioral intention, with improved explained variance ($\Delta R^2 = 0.095$). Model 3 introduced the worry $\times$ self-efficacy interaction term, which was significant ($B = 0.129$, $t = 2.134$, $p < 0.05$; $\Delta R^2 = 0.015$), indicating that the worry–intention association differed across levels of self-efficacy; specifically, the positive association between worry and intention was stronger when self-efficacy was higher.

Table 12. Moderation Effect Analysis.

	Model 1	Model 2	Model 3
Constant	2.574 ** (5.485)	1.574 ** (3.258)	2.561 ** (3.844)
Grade	−0.072 (−0.874)	−0.084 (−1.076)	−0.068 (−0.878)
Gender	0.243 (1.811)	0.192 (1.507)	0.181 (1.431)
Environmental Worry	0.298 ** (3.885)	0.337 ** (4.609)	−0.103 (−0.472)
Environmental Self-Efficacy		0.301 ** (5.329)	−0.002 (−0.010)
Environmental Worry $\times$ Environmental Self-Efficacy			0.129 * (2.134)
Sample Size	253	253	253
R^2	0.071	0.167	0.182
ΔR^2	0.071	0.095	0.015
F value	F (3, 249) = 6.383 $p = 0.000$	F (4, 248) = 12.413 $p = 0.000$	F (5, 247) = 10.983, $p = 0.000$

Note: Dependent variable = pro-environmental behavior intention * $p < 0.05$, ** $p < 0.01$, t-values in parentheses.

Model 1 included only the control variables of grade level, gender, and environmental worry along with the independent variable. Results indicated significant model fit ($F(3, 249) = 6.383$, $p = 0.000$), with an adjusted R^2 of 0.071. Environmental worry significantly and positively predicted pro-environmental behavioral intention ($B = 0.298$, $t = 3.885$, $p < 0.01$). However, the predictive effects of grade level ($B = -0.072$, $t = -0.874$, $p > 0.05$) and gender ($B = 0.243$, $t = 1.811$, $p > 0.05$) showed no significant predictive effects.

Model 2 incorporated the moderator variable environmental self-efficacy into Model 1, significantly improving model fit ($F(4, 248) = 12.413$, $p = 0.000$) with $\Delta R^2 = 0.095$, indicating that environmental self-efficacy substantially enhanced the model's explanatory power. At this stage, both environmental worry ($B = 0.337$, $t = 4.609$, $p < 0.01$) and environmental self-efficacy ($B = 0.301$, $t = 5.329$, $p < 0.01$) significantly and positively predicted pro-

environmental behavioral intentions, while grade and gender remained non-significant predictors.

Model 3 further introduced the interaction term between environmental worry and environmental self-efficacy. The model fit remained significant ($F(5, 247) = 10.983, p = 0.000$), with $\Delta R^2 = 0.015$, indicating that the interaction term significantly improved the model's explanatory power. Key results revealed a significantly positive interaction coefficient ($B = 0.129, t = 2.134, p < 0.05$), confirming that environmental self-efficacy exerted a significant positive moderating effect on the relationship between environmental worry and pro-environmental behavioral intention. Specifically, higher levels of environmental self-efficacy amplified the positive predictive effect of environmental worry on pro-environmental behavioral intention.

Further simple slope analysis (Table 13) showed that the positive association between environmental worry and behavioral intention was stronger under high environmental self-efficacy (+1 SD; $B = 0.490, p < 0.001$) than under low environmental self-efficacy (−1 SD; $B = 0.200, p = 0.040$), providing additional support for H5 in an associational sense (Figure 2).

Table 13. Simple Slope Analysis.

Moderator Level	Regression Coefficient	Standard Error	t	p	95% CI	
Mean	0.345	0.073	4.743	0.000	0.202	0.489
High Level (+1 SD)	0.490	0.102	4.804	0.000	0.289	0.692
Low Level (−1 SD)	0.200	0.097	2.060	0.040	0.009	0.391

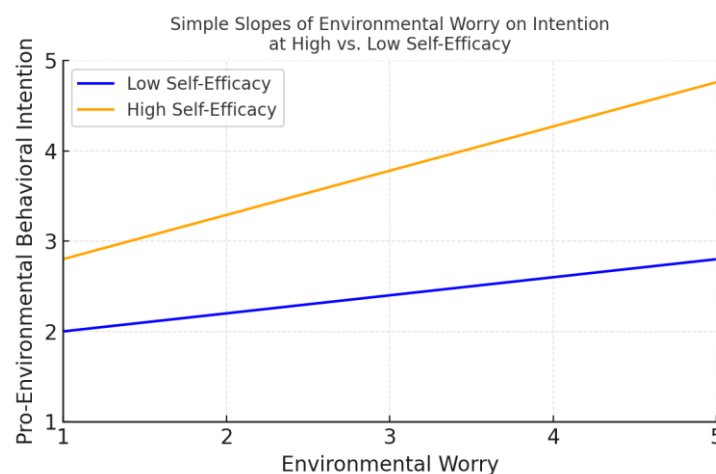


Figure 2. Simple Slope Plot.

4.5. Quantitative Test Conclusions

Overall, the quantitative results support H1–H5 and provide convergent evidence for a “double-edged sword” pattern. Specifically, higher exposure to negative environmental information was positively associated with environmental worry (supporting H1) and negatively associated with environmental self-efficacy (supporting H2). Consistent with the proposed dual-pathway mechanism, exposure showed two indirect associations with pro-environmental behavioral intention: a positive indirect association via increased worry (supporting H3) and a negative indirect association via reduced self-efficacy (supporting H4). Importantly, the negative indirect association through self-efficacy was comparable to—and in absolute magnitude slightly larger than—the positive indirect association through worry, suggesting that the inhibiting pathway may offset (or even dominate) the mobilizing pathway in some cases.

In addition, environmental self-efficacy moderated the relationship between environmental worry and pro-environmental behavioral intention (supporting H5). Simple slope tests indicated that worry was more strongly associated with intention when self-efficacy was high, whereas the association was weaker when self-efficacy was low. Taken together, these findings suggest that worry alone does not reliably translate into intention unless children also perceive actionable capacity and effectiveness. These quantitative patterns informed the subsequent qualitative phase, which was designed to explain why children's narratives diverge into mobilizing versus inhibiting trajectories under similar exposure conditions.

5. Qualitative Findings: Children's Narratives Amid Negative Environmental Information

Thematic analysis of the focus group transcripts revealed a clear hierarchical node structure. Coding results were organized around five parent nodes: sources of negative environmental information; information content and narrative frames; children's emotional experiences; assessments of efficacy and meaning regarding action consequences; and corresponding pro-environmental behavioral intentions. Notably, even with similarly high exposure to crisis- and loss-focused environmental narratives, children's accounts did not converge on a single direction. To facilitate integration with the quantitative model, the following sections are organized to map qualitative themes onto the two hypothesized mechanisms: a mobilization pathway in which exposure evokes worry that can motivate intention, and an erosion pathway in which exposure undermines efficacy-related judgments and weakens intention. We also highlight how efficacy resources condition whether worry is translated into action, consistent with the moderation pattern tested quantitatively.

5.1. *Everyday Experiences of Multi-Source Negative Environmental Information*

Interviews revealed that children's exposure to negative environmental information is rarely described as input from a single channel. Instead, it more commonly manifests as a daily experience interwoven with multiple sources. The push logic and narrative style of new media platforms provide high-frequency stimuli. Family retellings and evaluations of negative environmental information influence its meaning orientation. Schools, meanwhile, repeatedly present environmental risks in an institutionalized manner and offer normative interpretations. Content-wise, interviewees keep mentioning two categories of negative information: one centered on risky events and disaster imagery such as extreme weather, pollution incidents and ecological destruction; the other focused on social-responsibility narratives, such as high-carbon consumption, resource waste, and inaction by accountable actors. These multi-source and content-diverse exposures provide qualitative support for treating negative environmental information exposure (NEIE) as a composite daily experience rather than a single-channel input, as operationalized in the quantitative survey.

5.1.1. New Media

New media platforms were the most frequently cited source of negative environmental information among respondents. Compared to the regulated language of school textbooks, short videos heavily rely on visual impact and emotional headlines to capture attention. They insert environmental risks into children's everyday browsing in brief and incidental ways. Several children describe this exposure as "skippable", suggesting that crisis images attract attention quickly, but can also trigger short-lived discomfort and avoidance. One child said, "When I swipe past videos of massive fires burning down entire forests, it feels terrifying."

Moreover, platform content was not always one-dimensional. Some children reported that certain videos moved from risk and loss to remediation projects, ecological restoration, or policy mobilization. This framing allows the issues to be understood as serious but manageable. When retelling such content, children often emphasize the emotional relief and shift in judgment brought by the latter part of the video. One interviewee described desertification that, “At first, I thought it was terrifying that the desert was expanding. But then the video mentioned all the efforts we’ve made to eliminate the Mu Us Desert, so I feel like current environmental problems might also be solvable in the future.”

5.1.2. Family

Negative environmental information often reaches children through parents’ retellings and everyday discussions. Families play two roles in this process: First, they act as secondary disseminators of negative environmental information, keeping children exposed even when they do not actively seek out or directly encounter such content. Second, parents anchor these messages in concrete life contexts. They often “invoke” certain messages in daily talk, which increases salience, memorability, and perceived relevance.

First, some negative environmental information enters children’s lives through a “parents-see-first, children-hear-later” pattern. Respondents noted that parents mention pollution incidents, extreme weather, resource waste, and similar topics during dinner conversations, commutes, or while scrolling on their phones. Children develop sustained exposure through overhearing or passive reception. This pathway turns the family into a relay station for negative environmental information. Repeated discussion of the same topics increases the intensity of children’s exposure to those messages.

Second, and more importantly, families embed certain negative environmental messages as explanatory resources in everyday decisions. For example: “Last time I said we left the lights on when we went out. Dad said once we’re out we shouldn’t go back, leaving the lights on doesn’t cost much. I said it wastes resources, but Dad said the wealthy waste more than our whole neighborhood combined, so it doesn’t matter if we waste a little.” Here, the “wealthy waste” concept was not initiated by the child but introduced by the parent to justify the family’s choice. For the child, this signifies that such negative environmental information is not merely encountered. It is also embedded within a clear comparative frame through family interaction and becomes a recurring reference in daily life.

Meanwhile, interviews suggest that families do not always present negative environmental information in a uniformed way. Some parents pair negative messages with concrete guidance. They point out which behaviors contribute to environmental harm and which practices can reduce waste. In these cases, children receive not only the negative information but also an interpretive lens for classifying it and translating it into everyday choices.

5.1.3. School

Schools also serve as a significant channel for exposure to negative environmental information. Unlike the incidental and fragmented exposure on platforms, school-based information was delivered repeatedly through classroom instruction, textbook cases, campus publicity, and teacher reminders. This presentation carries a normative orientation, emphasizing the consequences of environmental damage, the severity of the problems, and the moral imperative to “make a difference”. When retelling classroom content, some children quoted teachers directly and linked environmental risks to their own futures. One child said, “The teacher said that if we keep wasting resources like this, the Earth will be destroyed in the future, and we won’t have anywhere to live.”

Moreover, schools do not always present negative information as risk descriptions. Materials indicate that, in school, risk messages were often paired with specific behavioral requirements, such as saving electricity, sorting waste, reducing single-use items, or joining related school activities. This arrangement placed risk awareness and action demands in the same instructional context. One child remarked, “Teachers tell us that environmental deterioration is severe, then have us start with actions like sorting trash and turning off lights.” This suggests that schools not only cultivate risk cognition but also provide clear behavioral reference points through institutionalized routines.

5.2. Emotional Experiences Following Exposure to Negative Environmental Information

Interview data show that the most prominent emotional response to negative environmental information was environmental worry. Children described worry as a persistent preoccupation with environmental risks and their consequences. This aligns with research expectations. Their accounts did not portray worry as a fixed, single-intensity state. Instead, worry unfolded as a process with three steps: experience, appraisal, and regulation. Worry initially manifests as imagining consequences and recurrent recollections, followed by assessments of the problem’s severity and controllability. It is finally amplified, alleviated, or redirected through attention management and emotional regulation strategies. Notably, children’s accounts primarily reflected sustained, future-oriented worry and subsequent regulation attempts, rather than brief fear reactions to an immediate threat cue, which aligns with our conceptualization and measurement of environmental worry in the quantitative phase.

5.2.1. Experiential Forms of Environmental Worry

Most interviewees described environmental worry as concrete imaginings and recurring recollections of future life. Common examples included more frequent or intense extreme weather, ongoing environmental deterioration, and disruptions to daily life. One child said, “I saw so many videos of typhoons blowing houses down. Now I always think at night, ‘What if a typhoon hits our area?’ I can’t sleep once I start thinking about it.” Another recalled, “When I saw news about dead fish in rivers and worsening water pollution, I suddenly recalled a lesson about rivers during class. It left me feeling gloomy, convinced drinking water won’t be safe anymore.”

Such expressions highlight the persistent quality of worries. In children’s narratives, negative environmental news does not just trigger emotions at the moment of exposure. After repeated exposure, children continued to ruminate. This pattern helps explain why worry may function as a “double-edged” mediator: it can heighten issue salience and motivate intention, yet—when paired with helplessness or limited coping resources—it may drift toward avoidance or emotional exhaustion. They used phrases such as “I keep thinking about it” and “I feel uneasy whenever I think about it.” Over time, worry shifted from a transient emotional fluctuation to a background preoccupation with risk.

5.2.2. The Evaluation Structure of Environmental Worry

In narratives of environmental worry, children often make two simultaneous judgments at the same time. They affirmed the severity of the problem, while also evaluated responsibility and the likely effectiveness of action. This pattern was especially salient when children encountered messages about elite wastefulness or high-carbon consumption. Many relied on scale comparisons and these comparisons reshaped their sense of what individual action can achieve. One child said, “I saw on Tiktok that one private jet trip by a wealthy person emits more than our whole family does in many years. It feels like protecting the environment is more effective if they act first.” This quote illustrates a common

cognitive frame. Children used emission scale differences to assign responsibility and to infer that individual actions have limited impact.

The materials also show a moderating pattern. When negative environmental information includes clear cues about governance actions and observable outcomes, children often pair worry with a belief that the problem is solvable. This keeps distress within manageable limits and leaves room for action intentions. For example, one child stated: “The teacher showed us news about an elderly person planting trees to combat desertification in the desert. The desert turned green. I think if everyone does their part, I can also take care of more green plants.”

5.2.3. Coping Mechanisms for Environmental Worry

Beyond evaluative structures, children also described daily coping strategies to manage their worries. The most common approach involved reducing emotional arousal through attention management, such as stopping further viewing, avoiding continued discussion, or shifting focus to other content. These practices did not necessarily signal denial. They functioned as self-management of emotional load under frequent negative stimuli. However, a likely consequence is interruption of sustained information seeking and deeper understanding, leaving worries suspended, neither translated into action nor systematically alleviated. Thus, the behavioral consequences of these worries depend more on whether actionable pathways and effective feedback become available later.

5.3. Environmental Self-Efficacy and Behavioral Intentions Under Exposure to Negative Environmental Information

The previous section indicates that environmental worry in children’s narratives do not automatically lead to action. What happens next often depends on two appraisals: “Can I act?” and “Will action work?” Therefore, this section shifts the analytical focus to environmental self-efficacy and its connection to pro-environmental behavioral intentions. Interview data suggest that children’s self-efficacy judgments draw mainly on two experiential cues. The first is perceived feasibility of specific behaviors. The second is expected effectiveness of action outcomes. These judgments are also shaped by perceptions of collective action.

5.3.1. Action Feasibility and Behavioral Scripts

In children’s narratives, self-efficacy is not primarily an abstract belief but rather a sense of mastery over action steps. When asked about willingness to engage in pro-environmental behaviors, many children began with statements such as “I know / don’t know how to do it” or “I can / can’t do it.” They linked this judgment to practical scripts in daily life.

Many children could clearly describe specific practices for pro-environmental daily behaviors, such as sorting waste, conserving electricity and water, or reducing single-use items. They linked “knowing how” to repeated reminders at school or in class. In these narratives, self-efficacy manifested as confidence in behavioral procedures rather than an overarching grasp of grand environmental issues. “Things like sorting trash, turning off lights, and using fewer plastic bags, my teachers have told us about these many times, and I feel I can stick with them.” Another noted, “My parents also teach me how to protect the environment. Sometimes I even remind them to put drink bottles in the recycling bin, and they praise me for it.” A third added, “I participated in the environmental protection activity our community held last time and learned some basic tips for conserving resources, which are all things we encounter in our daily lives.” These accounts suggest that children’s efficacy is often expressed through perceived feasibility of specific actions. When environmental protection is framed as manageable steps, behaviors are easier to routinize.

This supports more stable behavioral intentions. These narratives indicate that children's efficacy judgments are grounded in concrete action scripts ("I know how/I can do it"), which mirrors the content of the environmental self-efficacy items used in the quantitative scale.

5.3.2. Expectations of Effectiveness and Judgments of Action Significance

Knowing what to do does not guarantee sustained action. Children also care about the results of our actions as well. So, after a feasibility check, interviewees also estimate how effective they will be with an action. This judgment drew on responsibility attribution and scale comparisons, directly affecting the magnitude of their desire to continue acting. Importantly, these statements illustrate an erosion mechanism: when negative information is framed as large-scale, uncontrollable, and outcome-uncertain, children's perceived effectiveness and efficacy resources are undermined, which in turn dampens pro-environmental intention. This qualitative pattern provides an interpretive account for the negative indirect pathway via reduced self-efficacy in the quantitative model.

When negative environmental news emphasizes large-scale crises or apocalyptic narratives, some children infer that individual efforts make little difference. This reduces willingness to persist. Yet despite being given concrete tools, some view pro-environmental actions as having uncertain payoffs. They cite limited tangible rewards and little perceived feedback, and then finally withdraw their commitment. For instance, a participant stated, "I know I should turn off lights and sort trash, but I don't know if it even matters." "I'm just a kid; they won't listen to me." "I feel like what I save is nowhere near what's wasted. It just feels useless." Such statements indicate that perceived effectiveness serves as the critical link between self-efficacy and behavioral intent, determining whether an action is perceived as a worthwhile commitment.

5.3.3. Counter-Narratives and Collective Efficacy Effects

Beyond daily experiences and peer evaluations, negative environmental information itself provides clues for efficacy judgments. As mentioned earlier, some new-media content paired risk and loss with governance actions and visible outcomes, which are interpreted as evidence that problems can be addressed. In such contexts, children are more likely to form positive judgments about the controllability of issues, thereby reinforcing their efficacy expectations. This makes pro-environmental behavior more likely to be understood as part of collective efforts. For example, "I saw lots of adults on Tiktok filming themselves picking up trash at the beach. It feels like many hands make light work. If everyone picks up trash and no one litters, it could be cleaned up quickly."

It should be noted that collective-level efficacy cues do not automatically translate into individual self-efficacy. If children only conclude that the collective or state will solve the problem without corresponding pathways for "what I can contribute", their daily behavioral intentions may not strengthen. They could even shift toward dependence on external entities. For instance, "Last Arbor Day, I said I wanted to plant trees, but Mom said the country would handle it. What difference would one or two trees from us make? Even if I wanted to go, I wouldn't know where to plant them." "I think these are problems the country should solve. We can't do much anyway, as we have no money and can't control others. The police should arrest those people." Together, these accounts suggest that efficacy cues (especially those that provide actionable "what I can do" pathways) strengthen the likelihood that worry is translated into intention—consistent with the moderation logic that worry is more mobilizing when self-efficacy resources are higher.

5.4. *The Dual Role of Environmental Information Exposure and Its Differentiation Mechanism*

Thematic analysis of interview transcripts reveals that exposure to negative environmental information is frequently accompanied by environmental worry in most participants' narratives. However, this exposure does not uniformly lead to a singular orientation toward action. The clearest divergence appeared at the post-worry judgment stage. Children differed in how they assessed their capacity to act and whether action could produce positive outcomes. In other words, once worry was triggered by negative environmental information, environmental self-efficacy and perceived effectiveness became key determinants of pro-environmental behavioral intentions.

One kind of clear narrative is that of the child mentioning bad things about their environment and a series of actions they can do each day, and mentioning that they are provided with guidance through school-related educational activities. When interviewees recalled negative environmental information from classroom teaching, campus campaigns, or teacher reminders, they frequently described what should be done and how to do it. This supported the judgment "I can do it" and sustained more stable behavioral intentions. One child said, "Teachers have talked a lot about current environmental destruction. . . but they also say we can start with sorting trash and saving electricity. They even organized a week-long challenge before, with small prizes for those who stuck with it. I kept at it and got a pen as a reward." In this pattern, the threatening message remained present. However, when it was embedded in concrete routines and feedback, worry coexisted more easily with higher self-efficacy and aligned with action intentions.

Additionally, a similar effect appears in some new-media content. After describing risks and losses, some videos also showed governance actions and visible improvement. Children treated this as evidence that change is possible, which raised expected effectiveness. Yet outcome evidence alone did not always produce individual action intentions. Durable intentions were more likely when children could connect it to their own feasible daily behaviors; otherwise, it could foster a bystander orientation or shift expectations to "someone else" taking larger action.

Another narrative pattern centers on comparative scaling. Compared to the action-script stories, this accounts tends to rely more on negative data and large-scale examples such as high-carbon consumption, resource waste, and extreme reporting. Children contextualize their individual daily behaviors within larger-scale waste or emissions, leading them to conclude that personal actions have limited impact and making behavioral intentions more susceptible to wavering. "I've also seen news reports about people driving luxury cars and flying private jets, which really harm the environment. . . Plus, my grandfather says foreigners just make up all this environmental stuff to deceive us and hinder our country's development."

This type of account suggests that efficacy frustration stemmed less from "I can't do it" and more from "it won't work." The constraint lay in low expected effectiveness, not low perceived ability. In this pathway, the family context was not only a channel of exposure, but also reinforced interpretation through repeated narration and appraisal. Certain stories—especially those highlighting large-scale waste or emissions—were repeatedly invoked in everyday decisions. This recurrent framing further strengthened children's perceptions of low expected effectiveness and low personal efficacy. Such accounts help interpret the erosion pathway observed quantitatively, where exposure is linked to lower intention via diminished efficacy-related judgments—especially when children infer that individual actions are negligible relative to large-scale problems.

Overall, the qualitative data indicate that the differentiated consequences of exposure to negative environmental information do not hinge on whether children develop environmental worry. The key lies in what happens after worry emerges. Children differ

in whether they can access actionable behavioral references and whether they can form stable expectations that actions will be effective. This mechanism also helps explain the quantitative finding that environmental self-efficacy mediates the relationship between environmental worry and pro-environmental behavioral intention. When self-efficacy is high and efficacy expectations are stable, worry is more likely to coexist with action intention. When self-efficacy is low and efficacy expectations are unstable, worry is more likely to be accompanied by decreased or fluctuating intention. Taken together, the qualitative evidence supports both the mediation role of self-efficacy (erosion pathway) and its moderating role in shaping whether worry becomes mobilizing rather than debilitating. To further integrate these findings with the quantitative analysis, the relationships between qualitative narratives and the hypotheses (H1–H5) are summarized in Table 14, which links parent and child nodes from interviews to illustrative quotes and the corresponding quantitative pathways.

Table 14. Qualitative–Quantitative Integration Framework.

Parent Node	Child Node	Illustrative Quote	Link to Quantitative Pathway
Information sources	New media	“When I swipe past videos of massive fires burning down entire forests, it feels terrifying.”	Across new media, family, and school, negative environmental information is encountered through multiple channels that are routinely embedded in children’s daily contexts; taken together, these sources justify modelling negative environmental information exposure as an integrated predictor in the quantitative tests (H1–H5).
	Family	“Dad said the wealthy waste more than our whole neighborhood combined, it doesn’t matter if we waste a little.”	
	School	“The teacher said that if we keep wasting resources like this, the Earth will be destroyed in the future, and we won’t have anywhere to live.”	
Information content	Risk events and disaster imagery	“I saw so many videos of typhoons blowing houses down. . . I can’t sleep once I start thinking about it.”	The content patterns reported by children clarify the “double-edged” logic tested in the model: disaster and risk imagery is consistently narrated as eliciting worry (supporting H1), whereas responsibility and scale-comparison narratives are narrated as weakening perceived individual effectiveness (supporting the efficacy-erosion interpretation behind H2 and H4); governance and improvement cues, when present, help explain why worry is more likely to convert into intention under stronger efficacy resources (supporting H5).
	Elite waste and high-carbon consumption narratives	“One private jet trip by a wealthy person emits more than our whole family does in many years. . . it is more effective if they act first.”	
	Governance actions and improvement outcomes	“The desert turned green. . . I think if everyone does their part, I can also take care of more green plants.”	
Emotional experiences	Persistent worry and rumination	“It makes me feel uneasy whenever I think about it.”	The emotional accounts substantiate environmental worry as a sustained, recurrent experience rather than a momentary reaction, aligning with its role as the affective mediator in the quantitative model (H3); the co-presence of appraisal and withdrawal narratives further helps interpret why worry yields divergent behavioral implications across children, consistent with the moderated conversion pattern (H5) and the mixed mechanism interpretation.
	Severity and controllability appraisal embedded in worry	“Dad said the wealthy waste more than our whole neighborhood combined. . .”	
	Emotion regulation through attention management	“When I swipe past videos. . . it feels terrifying.”	
Self-efficacy evaluation	Action feasibility and behavioral scripts	“Things like sorting trash, turning off lights. . . I feel I can stick with them.”	The self-efficacy evaluations indicate that efficacy is anchored both in having feasible behavioral scripts and in judging whether one’s action is effective and meaningful; these appraisals support the efficacy-based erosion mechanism that undermines intention (H4) while also explaining why higher efficacy strengthens the translation from worry to intention (H5).
	Expected effectiveness and action significance	“I know I should turn off lights and sort trash, but I don’t know if it even matters.”	
	Collective cues and externalization risk	“Mom said the country would handle it. . . What difference would one or two trees from us make?”	

Table 14. Cont.

Parent Node	Child Node	Illustrative Quote	Link to Quantitative Pathway
Behavioral intentions	Daily pro-environmental practices	“Sorting trash, turning off lights, and using fewer plastic bags...”	The intention narratives anchor the dependent variable used in the quantitative analyses in concrete, everyday and participatory forms of pro-environmental intention; together they provide qualitative context for the intention outcomes examined in the mediation and moderation tests (H3–H5).
	Participation in collective activities	“They even organized a week-long challenge... I kept at it and got a pen as a reward.”	
	Reminding others	“Sometimes I even remind them to put drink bottles in the recycling bin, and they praise me for it.”	

6. Discussion and Conclusions

6.1. Discussion

This study, targeting upper-grade elementary students in eastern Chinese cities, combines quantitative testing with focus groups to examine and explain the mechanisms through which exposure to negative environmental information influences pro-environmental behavioral intentions. Overall results indicate that such exposure does not lead to unidirectional outcomes but simultaneously activates two distinct indirect pathways. First, it increases environmental worry, which correlates with higher pro-environmental behavioral intentions; Second, it is associated with lower pro-environmental behavioral intentions via reduced environmental self-efficacy. The same type of negative environmental information may not only mobilize children’s pro-environmental behavior but also inhibit it. Thus, it exhibits an overall double-edged sword characteristic. Given the cross-sectional design, these patterns should be interpreted as associations; nonetheless, the relative magnitudes of the two indirect pathways are substantively meaningful for communication and education design.

This finding directly engages existing social science research on sustainable action. Previous environmental behavior studies and meta-analyses consistently emphasize that pro-environmental behavior and intentions are not driven solely by knowledge or emotion, but are shaped collectively by psychological factors such as attitudes, norms, and perceived efficacy. The contribution of this study lies not in reiterating the established judgment that may mobilize action, but in placing children within a specific information ecosystem. It reveals that contemporary negative environmental information more frequently enters children’s experience through the “crisis narrative-blaming-scale comparison” approach, thereby activating both worry and efficacy assessment within the same chain, ultimately leading to divergent intention trajectories. In other words, children are not simply frightened by crisis information or motivated by environmental education. Instead, through sustained exposure, they continuously engage in a chain of judgments: “Is the problem serious?” “Can I do something about it?” and “Will my actions make a difference?” Among these, the assessment of efficacy is the most critical and the most fragile link. From an international perspective, our findings align with cross-national research showing that children’s climate-related concern is widespread, yet the action implications depend on perceived efficacy and available coping resources. At the same time, the urban Chinese context may shape how worry and efficacy co-evolve. School-based environmental education and collective-action messaging are comparatively salient in China’s “ecological civilization” agenda, which may provide more frequent action scripts and normative reinforcement; however, highly visible crisis narratives and large-scale comparisons in platform media may also amplify low expected effectiveness (“my actions are negligible”). This combination may help explain why exposure can simultaneously mobilize intention through worry while eroding intention via efficacy-related judgments.

Although the two indirect pathways move in opposite directions, their effect sizes are not merely statistically significant but practically interpretable: small shifts in efficacy-related judgments may translate into meaningful differences in children's willingness to persist with everyday pro-environmental practices. This underscores why communication that increases worry without supporting efficacy can backfire, whereas the same exposure accompanied by action scripts and effectiveness cues can be mobilizing.

Based on these findings, the implications for the Sustainable Development Goals are most directly connected to SDG 4 (Quality Education, particularly Education for Sustainable Development), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action), and—given the urban information environment—SDG 11 (Sustainable Cities and Communities). This prevents children, after repeated exposure to narratives of grand crises and structural injustice, from crystallizing their worries into a judgment of helplessness. Sustainable transformation relies not only on technological and institutional provision but also on intergenerational willingness to act and a foundation of public participation. Sustainable communication and education for minors particularly require tightly linking risk warnings with daily actions, visible feedback, and collective participation pathways. In SDG terms, this means coupling risk awareness with developmentally appropriate action scripts, visible feedback, and collective pathways so that worry is less likely to crystallize into helplessness and more likely to support sustained intention. This minimizes information structures that emphasize severity without offering actionable outlets, thereby strengthening the psychological foundation for future sustainable action. Practically, implications operate at two levels. For schools, curricula and routines can pair risk information with repeated, doable practices (e.g., action checklists, classroom challenges, and feedback on collective outcomes) to build efficacy through mastery experiences. For media environments, guidance can encourage platforms and content producers to complement crisis framing with credible solution cues and “what I can do” pathways, reducing purely catastrophic narratives that invite disengagement or bystander orientations.

To situate these findings within the broader literature, we next compare our results with evidence from Western contexts and discuss how China's educational and sociocultural setting may shape the worry–efficacy–intention mechanism. Compared with findings reported in Western contexts, our results suggest a similar “dual-pathway” pattern—negative environmental information can both mobilize and erode pro-environmental intentions—but the balance between these pathways may be shaped by the Chinese educational and sociocultural setting. In many Western studies, eco-anxiety and climate worry among adolescents are frequently discussed in relation to perceived governmental inaction, uncertainty about collective solutions, and limited personal control, which can amplify helplessness and disengagement alongside activism (e.g., studies on youth climate worry and eco-anxiety). In our urban Chinese sample, however, children's narratives indicate that school-based environmental education and routine “action scripts” (e.g., waste sorting, saving electricity, classroom campaigns) provide concrete behavioral reference points that can make worry more readily translatable into intention when efficacy cues are present. At the same time, China's strong normative discourse on ecological civilization and collective responsibility may intensify moral salience and sustain attention to environmental risks, while also increasing exposure to large-scale “crisis-and-blame” framings (e.g., conspicuous consumption, resource waste, structural injustice). Such framings can undermine perceived effectiveness—children may conclude that individual efforts are negligible compared with societal-level emissions—thereby weakening self-efficacy and producing the erosion pathway. Taken together, these patterns imply that, relative to some Western settings where the primary barrier may be perceived societal inaction, the Chinese urban context may simultaneously strengthen mobilization through institutionalized school practices and

heighten erosion when negative information is paired with scale comparisons that obscure actionable links between “what I can do” and “what changes.” This comparison highlights the broader relevance of our findings: effective sustainability communication for children likely requires not only risk salience, but also culturally and institutionally grounded efficacy cues that connect collective narratives to feasible individual contributions.

This study also has limitations. First, the quantitative data consists of cross-sectional self-reported information. Although the statistical pathways align with interview interpretations, the direction of causality requires longitudinal tracking or contextual experiments to identify the causal direction further. Second, the sample comes from two schools in the same city, which necessitates caution when extrapolating the findings to different regions, urban/rural contexts, or varying media usage patterns. Future research should validate model robustness across broader samples and compare mechanism differences under diverse information ecosystems (e.g., media usage intensity, family discussion frequency, school practice density). Additionally, the study employed cluster sampling at the class level. Additionally, because data were collected by class, responses may be partially clustered within classes; future work should apply multilevel modeling or cluster-robust inference to account for this nesting more explicitly. Third, while grade and gender were controlled for, other potential confounders, such as children’s socioeconomic background, parental environmental behaviors and attitudes, environmental knowledge levels, and social norms, were not accounted for.

In addition, NEIE was measured as frequency of exposure; future studies could extend the measure by separately assessing perceived impact/impression intensity and examining whether frequency and perceived impact show distinct associations with children’s worry, efficacy, and intentions. These factors could simultaneously influence both information exposure and pro-environmental intentions. Thus, this study offers an explanation from the perspectives of affect and cognitive efficacy but does not present a complete picture. This constitutes both an objective interpretation of the findings and a promising outlook for future research. Fourth, the Negative Environmental Information Exposure Scale is a self-developed measure tailored to the child context. Future work could enhance its structural stability through confirmatory analyses with larger samples and cross-sample validation, while incorporating media logs or objective usage metrics to reduce homogeneity bias.

6.2. Conclusions

This study examined how children’s exposure to negative environmental information relates to pro-environmental behavioral intentions in urban China by combining survey-based mediation/moderation analyses with focus-group evidence. Across both data strands, the findings support a “double-edged sword” mechanism: exposure to negative environmental information is associated with greater environmental worry that can mobilize intentions, while simultaneously being linked to reduced pro-environmental intentions via lowered environmental self-efficacy. The qualitative narratives further clarify why these pathways diverge: children’s worry becomes action-oriented when it is accompanied by concrete, feasible behavioral scripts and credible efficacy cues (e.g., actionable steps, visible feedback, collective participation). In contrast, when negative information is paired with large-scale comparisons, repeated blame narratives, or uncertain payoffs, children are more likely to shift from “I can do it” to “it won’t work,” undermining perceived effectiveness and weakening intentions.

These conclusions carry practical implications for sustainability communication and education targeting minors. Rather than minimizing negative environmental information, communicators and educators should prioritize how such information is framed and supported: risk messages are most constructive when they are coupled with age-appropriate,

verifiable action pathways that connect everyday behaviors to meaningful outcomes and reinforce both individual and collective efficacy. School-based interventions can play a particularly important role by institutionalizing small but repeatable practices, providing feedback that sustains motivation, and helping children interpret large-scale environmental problems through a lens of feasible contribution rather than helplessness.

Overall, this study contributes to international discussions on children’s environmental emotions by demonstrating that worry is not inherently motivating or debilitating; its behavioral consequences depend on the availability of efficacy resources and interpretive cues in children’s information environment. Future research should test the robustness of these mechanisms across broader and more diverse samples and examine how different media ecologies and educational practices shape the worry–efficacy–intention link over time.

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Appendix A

Table A1. Survey Items and Response Scales.

Survey Items	Name	Response Scales
Negative Environmental Information Exposure (NEIE)	A1	I have been exposed to “bad news” related to environmental pollution, ecological destruction, or extreme weather events.
	A2	I have seen or heard uncomfortable images or stories related to the environment (e.g., garbage piles, polluted rivers, deforestation, injured animals).
	A3	I have encountered discussions or statements saying “environmental issues are severe and difficult to solve.”
	A4	I have encountered discussions or content about “wealthy people/celebrities wasting resources and causing environmental pollution.”
	A5	I have encountered discussions or statements like “many people don’t care about the environment/no one is responsible for protecting the environment/it’s impossible to change anything.”
	A6	Overall, in the past month, I have frequently encountered information that makes me feel “the environment is deteriorating/it’s dangerous.”

Table A1. Cont.

Survey Items	Name	Response Scales
Environmental Worry (EW)	B7	I often worry that environmental problems will affect my future life.
	B8	When I think about environmental issues, I worry for a long time.
	B9	I frequently think about the worsening of the environment or the increasing frequency of extreme weather.
	B10	I worry that people will not be able to solve these environmental issues when I grow up.
	B11	Environmental problems make me feel uneasy.
Environmental Self-Efficacy (ESE)	C12	I believe I can do something to protect the environment.
	C13	Even as a student, I believe my actions can have some impact on the environment.
	C14	I know some environmentally friendly actions I can take in my daily life (e.g., saving water and electricity, reducing the use of single-use items).
	C15	If I continue doing environmentally friendly actions, I may influence others around me to do the same.
	C16	Even if environmental problems are significant, I believe that many small actions by individuals can lead to change.
Pro-environmental Behavioral Intention (PEBI)	D17	I try to turn off the lights and water taps to save water and electricity.
	D18	I try to sort my trash and avoid littering.
	D19	I try to reduce the use of disposable items (e.g., disposable cups, plastic bags, straws).
	D20	I am willing to participate in environmental activities organized by my school/class (e.g., tree planting, cleaning, environmental awareness campaigns).
	D21	I am willing to remind my family or classmates to reduce waste and engage in environmental actions.

Note: NEIE items (A1–A6) were rated on a 5-point frequency scale (1 = almost never, 5 = very frequently) with reference to the past month. EW, ESE, and PEBI items (B7–B11, C12–C16, D17–D21) were rated on a 5-point agreement scale (1 = Strongly Disagree, 5 = Strongly Agree).

Table A2. Reliability Analysis.

Dimension	Name	Corrected Item-Total Correlation (CITC)	Alpha Coefficient for Deleted Items	Cronbach's α Coefficient
Negative Environmental Information Exposure	A1	0.688	0.848	0.872
	A2	0.66	0.853	
	A3	0.635	0.857	
	A4	0.661	0.852	
	A5	0.662	0.852	
	A6	0.732	0.84	
Environmental Worry	B7	0.655	0.829	0.855
	B8	0.701	0.817	
	B9	0.668	0.826	
	B10	0.637	0.834	
	B11	0.684	0.822	
Environmental Self-Efficacy	C12	0.812	0.887	0.913
	C13	0.762	0.897	
	C14	0.799	0.889	
	C15	0.749	0.9	
	C16	0.773	0.895	
Pro-environmental behavior intention	D17	0.755	0.894	0.910
	D18	0.766	0.892	
	D19	0.753	0.895	
	D20	0.795	0.886	
	D21	0.794	0.886	

Table A3. Variance Explained.

Factor ID	Characteristic Root			Variance Explained Before Rotation			Variance Explained After Rotation		
	Characteristic Root	Variance Explanation Rate %	Cumulative %	Eigenroot	Variance Explained %	Cumulative %	Eigenvalue	Variance Explained %	Cumulative %
1	5.768	27.469	27.469	5.768	27.469	27.469	3.743	17.822	17.822
2	4.673	22.253	49.721	4.673	22.253	49.721	3.695	17.596	35.419
3	2.153	10.253	59.974	2.153	10.253	59.974	3.681	17.531	52.949
4	1.745	8.307	68.281	1.745	8.307	68.281	3.220	15.332	68.281
5	0.654	3.112	71.393	-	-	-	-	-	-
6	0.635	3.024	74.417	-	-	-	-	-	-
7	0.542	2.582	76.999	-	-	-	-	-	-
8	0.511	2.432	79.431	-	-	-	-	-	-
9	0.495	2.356	81.787	-	-	-	-	-	-
10	0.436	2.078	83.865	-	-	-	-	-	-
11	0.416	1.979	85.844	-	-	-	-	-	-
12	0.410	1.951	87.795	-	-	-	-	-	-
13	0.386	1.840	89.635	-	-	-	-	-	-
14	0.374	1.780	91.415	-	-	-	-	-	-
15	0.322	1.533	92.949	-	-	-	-	-	-
16	0.293	1.396	94.345	-	-	-	-	-	-
17	0.274	1.304	95.649	-	-	-	-	-	-
18	0.260	1.237	96.886	-	-	-	-	-	-
19	0.245	1.168	98.054	-	-	-	-	-	-
20	0.207	0.987	99.042	-	-	-	-	-	-
21	0.201	0.958	100.000	-	-	-	-	-	-

Table A4. Rotated Factor Loadings.

Name	Factor Loadings				Commonality
	Factor 1	Factor 2	Factor 3	Factor 4	
A1	−0.110	0.765	0.059	0.179	0.634
A2	−0.038	0.775	0.104	0.063	0.617
A3	−0.072	0.697	0.097	0.261	0.568
A4	−0.124	0.734	0.151	0.122	0.591
A5	−0.086	0.728	0.170	0.173	0.596
A6	−0.097	0.807	0.134	0.113	0.691
B7	−0.024	0.067	0.143	0.774	0.625
B8	−0.038	0.184	0.061	0.799	0.678
B9	0.062	0.238	0.038	0.768	0.651
B10	−0.160	0.129	0.162	0.735	0.609
B11	−0.038	0.191	0.038	0.786	0.657
C12	0.884	−0.066	0.080	−0.044	0.793
C13	0.840	−0.078	0.114	−0.014	0.725
C14	0.842	−0.141	0.208	0.007	0.772
C15	0.827	−0.089	0.127	−0.042	0.709
C16	0.823	−0.128	0.157	−0.113	0.731
D17	0.178	0.090	0.823	0.051	0.719
D18	0.096	0.175	0.822	0.127	0.732
D19	0.112	0.167	0.817	0.065	0.712
D20	0.172	0.144	0.828	0.164	0.763
D21	0.144	0.121	0.852	0.077	0.767

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