Journal of Early Childhood Education Research
Volume 14, Issue 1, 2025, 28–46
https://doi.org/1058955/jecer.147025

JECER

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Exploring children's emotional responses to pollution: Implications for environmental education

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ABSTRACT: Understanding young children's emotional responses to environmental issues is crucial for shaping their attitudes and behaviours towards the environment. In the current study, we explore these responses through the lens of Social Learning Theory. Employing a constructivist paradigm, the research examines how children's interactions and experiences shape their perceptions and emotional reactions to environmental challenges. Using an interpretive research design, the study focuses on three children aged 4 to 5 years, selected from diverse preschools in Bloemfontein, to capture a broad spectrum of emotional responses to environmental stimuli. Two distinct images, one depicting dead fish surrounded by garbage and the other showing protesters burning tires—were used to provoke emotional reactions and reflections on environmental pollution and its consequences. Semi-structured interviews were conducted to gain insights into the children's feelings, thoughts, and interpretations of these scenarios. Findings highlight the role of observational learning and social context in shaping children's environmental attitudes and emotional responses. The study underscores the importance of understanding young learners' perspectives on environmental issues, revealing the intricate relationship between human activities and ecological health. This research contributes to the broader discourse on environmental education and the emotional dimensions of early childhood learning.

Keywords: emotional responses, environmental issues, Social Learning Theory, early childhood education

Introduction

Environmental concerns, particularly pollution, are pressing global challenges that threaten both planetary health and human well-being (Dryzek, 2022). Pollution whether in the form of air, water, soil, or noise, has profound effects on ecosystems, wildlife, and human populations (Ajibade et al., 2021). In response, education and awareness play a pivotal role in preparing current and future generations to tackle these issues and promote sustainable practices (Sauvé et al., 2016).

However, much of the focus on environmental issues has been on adult actions and responsibilities, often overlooking the emotional and cognitive impacts on children (Martin et al., 2022). Children, uniquely vulnerable to the effects of environmental degradation, often experience negative health outcomes due to a deteriorating environment (Manisalidis et al., 2020). They are also exposed to environmental issues through various channels such as media, education, and family discussions, shaping their worldview from an early age (Stokols, 2018). This early exposure to environmental concerns may foster a sense of responsibility toward sustainability, which could influence children's future behaviours and advocacy efforts (Stokols, 2018). Therefore, it is essential to consider not only adult-driven policy and action but also how children's emotional and cognitive responses can influence environmental attitudes and behaviours (Baker et al., 2021).

Despite the growing recognition of these concerns, there is a gap in understanding how children emotionally respond to pollution and environmental degradation. While research has explored children's cognitive understanding of environmental issues, such as pollution (Alp et al., 20), emotional responses remain underexplored. Current studies often fail to address how these emotions such as fear, sadness, concern, can influence children's attitudes toward environmental issues (Crandon et al., 2022). Addressing this gap is crucial for developing educational strategies that foster environmental stewardship from a young age, shaping children into informed, empowered advocates for sustainability.

The importance of understanding how pollution affects children emotionally cannot be overstated. Children's emotional responses to environmental threats, whether through fear or concern, can motivate sustainable behaviours, while feelings of helplessness or apathy might lead to disengagement (Kim et al., 2023). Our study, therefore, aims to explore how environmental pollution evokes emotional responses in young children and how these emotional reactions shape their environmental attitudes and behaviours.

Theoretical framework

Social Learning Theory (SLT) by Albert Bandura (1977) serves as the foundation for understanding how children's emotional responses to environmental pollution develop. SLT emphasizes that children acquire emotional responses, attitudes, and behaviours by observing and imitating the actions of others, particularly parents, teachers, and peers. This observational learning process enables children to internalize emotional reactions to issues like environmental pollution, shaping their emotional responses and behaviours (Bandura, 2001).

However, understanding children's emotional engagement with environmental issues requires an interdisciplinary approach. Ecological Systems Theory (Bronfenbrenner, 1979) provides a broader perspective on how multiple environmental influences, ranging from immediate family and school (microsystem) to societal norms and policies (macrosystem), shape children's emotional and behavioural development. Children's environmental awareness and emotional responses are influenced not only by direct social interactions but also by larger structural and cultural factors.

Affective Domain Theory (Krathwohl et al., 1964) further explains how emotions influence learning and decision-making. This theory highlights how children's affective engagement with environmental issues can progress from simple awareness to internalized values and behaviours. Emotional connections to environmental concerns, such as fear of pollution or empathy for wildlife, motivate children to take protective actions, reinforcing the role of emotions in environmental education (Chawla, 1999).

Observational learning is central to SLT, where children learn by watching and mimicking the behaviours and emotional reactions of others (Bandura, 1969). This process is especially relevant in understanding how children's emotional responses to environmental pollution evolve. Research shows that children who observe adults or peers expressing concern about pollution are likely to internalize and replicate these emotions, influencing their pro-environmental attitudes and behaviours (Woszidlo & Kunkel, 2017). For instance, a teacher expressing concern about pollution may inspire a child to develop a similar emotional response, motivating them to engage in sustainable practices.

Furthermore, the Theory of Planned Behaviour (Ajzen, 1991) helps explain how children's emotional responses to environmental issues translate into intentional pro-environmental behaviours. The theory posits that attitudes, subjective norms, and perceived behavioural control influence behaviour. In the context of environmental education, children observed emotional reactions (e.g., concern or distress about pollution) contribute to their attitudes toward sustainability and influence their

likelihood of engaging in environmentally responsible actions (Kollmuss & Agyeman, 2002).

SLT underscores the importance of modelling, where children learn not only by observing others but also by imitating their behaviours and emotional responses. Parents, teachers, and peers serve as models whose actions regarding environmental pollution significantly affect how children emotionally engage with these issues. For instance, children who see adults recycling, expressing concern for pollution, or taking steps to reduce waste are more likely to adopt similar behaviours (Thompson & Russell, 2004). Positive reinforcement plays a key role in this process, as children are encouraged to engage in pro-environmental actions when their behaviour is acknowledged or rewarded.

Moreover, the concept of climate emotions (Ojala, 2012; Hickman et al., 2021) highlights the role of emotional engagement in shaping environmental attitudes. Research on eco-anxiety and environmental grief suggests that children's emotional responses to climate and pollution-related issues can influence their willingness to take action. Studies indicate that fostering hope, rather than fear, is essential in promoting positive environmental behaviours (Ojala, 2012). This aligns with SLT's emphasis on reinforcement and motivation, where positive emotional engagement leads to proactive environmental stewardship.

SLT, combined with these complementary theories, provides a robust framework for understanding how children's emotional responses to environmental pollution are shaped by their social environment. Our study explores how children's emotional reactions to pollution are influenced by observing the emotional responses of others, such as parents and teachers. Therefore, by analyzing these emotional reactions, we can better understand how children develop attitudes toward environmental responsibility. SLT, in conjunction with affective learning, ecological systems, and behavioural theories, offers a comprehensive perspective on emotional engagement with environmental issues.

The integration of these theories is particularly valuable in designing educational interventions that promote emotional engagement with environmental issues. Therefore, by fostering emotional connections to environmental concerns, SLT and related frameworks can guide the development of programmes that encourage children to take proactive steps in addressing pollution and other environmental challenges. This underscores the importance of addressing emotional engagement with environmental issues in early childhood education, ensuring that children develop responsible attitudes and behaviours toward environmental sustainability.

Methods

We adopted the constructivist paradigm, which posits that knowledge is actively constructed through individuals' social interactions and experiences within their environments (Amineh & Asl, 2015). This perspective emphasizes that learning is not a passive absorption of information but a dynamic process in which individuals develop understanding through engagement with others and their surroundings. Aligned with this view, Social Learning Theory (SLT), as articulated by Bandura (1977), highlights the significance of social context in shaping learning outcomes and emotional responses. Therefore, by incorporating SLT, we acknowledge the crucial role of social interactions in influencing how children perceive, emotionally react to, and respond to environmental issues.

To explore these emotional responses in depth, we employed an interpretive research design, which allowed for a nuanced examination of young children's subjective emotional experiences and understandings of environmental issues (Jones & Davison, 2021). This design facilitated an in-depth analysis of how children interpret, emotionally engage with, and attribute meaning to environmental scenarios within their social contexts. Therefore, by focusing on these emotional dimensions, we aimed to uncover the ways in which children process and respond to environmental challenges, offering valuable insights into their perspectives and subjective interpretations. This approach enabled a comprehensive exploration of how children's emotional engagement with environmental issues is shaped by their interactions with peers, adults, and their immediate surroundings, thereby enhancing our understanding of their environmental awareness and emotional responses.

Grounded in a qualitative research approach inspired by Frost (2021), our study sought to capture the depth and complexity of children's emotional reactions to environmental scenarios. This qualitative framework allowed for a rich, detailed analysis of how children emotionally engage with and interpret environmental challenges, revealing the profound and personal meanings they attach to these issues. The methodological choice was driven by the need to explore the intricate nature of children's emotional responses to environmental stimuli, emphasizing the importance of personal and contextual factors in shaping their environmental awareness.

To achieve this depth of analysis, we employed a case study methodology, which provided a detailed, context-specific exploration of individual children's emotional engagement with environmental issues. Case studies have proven effective in offering rich data through in-depth observations, as demonstrated in previous research. For example, Ozturk (2021) explored how children's environmental awareness evolves in different familial and educational contexts, while Barker and Nancarrow (2001) examined

children's emotional responses to climate change education. Their findings showed that individual narratives provide deeper insight into how children internalize environmental concepts and engage emotionally with them. These studies highlight that small sample sizes can yield detailed case reports, shedding light on the complexity of children's emotional reactions and the factors shaping their environmental attitudes.

Participants and procedure

Purposive sampling was used to select three children aged 4 to 5 years from multiple preschools in Bloemfontein, South Africa. As a major city, Bloemfontein provided a distinct cultural and geographical context for the study, allowing for an exploration of how environmental awareness develops in young learners within this setting. To ensure consistency in their daily experiences while capturing diverse perspectives, all participants were enrolled in the same after-school care program. This setting offered a structured yet varied environment for observation, enabling a deeper understanding of how cultural, social, and educational factors shape children's emotional engagement with environmental issues. Therefore, by clearly outlining the selection method, the study maintains transparency and strengthens its ability to provide a nuanced analysis of how young children interpret and respond to environmental challenges.

To investigate children's emotional responses to environmental issues, we presented them with two distinct environmental images, each illustrating a different form of pollution and its ecological consequences. Figure 1 depicted a distressing scene of dead fish surrounded by washed-up garbage on a beach, vividly portraying the impact of human activities on aquatic ecosystems. This image aimed to elicit reactions related to pollution's effects on marine life and broader environmental concerns. Figure 2 illustrated protesters burning tires, emphasizing the environmental and health risks associated with air pollution and societal unrest.

FIGURE 1 Dead fish on the beach

FIGURE 2 Protesters burning tires

These images were selected to engage children emotionally and stimulate reflection on the impact of pollution on marine life and air quality. The choice was guided by a place-based approach, focusing on local environmental issues that children could relate to, such as pollution and environmental hazards. Therefore, by using familiar contexts, the images helped children connect their surroundings to broader environmental challenges, reinforcing the idea that their actions can impact their local environment.

Data collection

The interviews were conducted in a safe after-school setting, with caregivers present to provide emotional support. After viewing the images, the children participated in reflective discussions, where they were encouraged to think critically about how they, with adult guidance, could address the environmental issues shown. The facilitator guided the conversation, prompting the children to consider practical actions they could take in their communities, fostering a sense of agency and responsibility.

While the children's emotional responses were acknowledged, the primary aim was to foster environmental awareness and empathy. This approach ensured that the children were supported in exploring their thoughts and feelings in a safe space, connecting their personal experiences to the broader environmental issues depicted in the images.

The data collection process sought to explore how children emotionally engaged with environmental issues and encourage reflection on their broader implications for environmental health and societal well-being. Since English was the medium of instruction at the children's schools, the questions were presented in English to ensure clarity and comprehension. The study was conducted in a familiar and secure preschool aftercare setting.

Each child viewed the images individually, starting with the scene of the dead fish (Figure 1) and then progressing to the image of burning tires (Figure 2). During the semi-

structured interviews, the questions were designed to prompt the children to express their feelings and thoughts about the environmental scenarios. Open-ended questions allowed them to freely articulate their responses, such as:

- "How do you feel when you see the dead fish?"
- "What do you think is happening in the picture with the burning tires?"
- "Why do you think the fish is dead?"
- "What do you think the people are doing with the burning tires?"

To facilitate reflection, the interviewer rephrased or repeated questions for clarity when needed, maintaining a conversational tone throughout. For instance, if a child seemed unsure, the interviewer might ask, "Can you tell me more about why that makes you feel sad?" or "What do you think happens when we do this to the environment?" The goal was to create a supportive environment where the children felt comfortable sharing their feelings and thoughts.

The interviews lasted approximately 15-20 minutes to ensure the children had ample time to reflect and respond without feeling overwhelmed. During the interviews, the interviewer closely observed the children's facial expressions, body language, and emotional reactions, noting how they engaged with the images and concepts. A substantial amount of data was gathered, including both verbal responses and non-verbal cues. This data was analyzed to identify patterns in emotional responses and how children perceive and react to environmental issues. Therefore, by combining qualitative and observational data, the study aimed to provide rich insights into young learners' emotional connections to environmental challenges.

Data analysis

Similar to Strife (2012), thematic analysis was employed to analyze the transcriptions of the interviews, aiming to uncover the depth of children's emotional engagement with environmental concerns. Thematic coding was used to systematically examine the children's responses to the environmental scenarios, identifying recurring patterns and underlying concepts (Schill et al., 2022). As a qualitative research method, thematic analysis facilitated the organization of the data into distinct thematic categories. These themes were constructed based on the children's emotional reactions to environmental issues, their awareness of these issues, and the solutions they suggested.

The themes presented in Table 1 were derived through a systematic process of thematic analysis, which involved examining the transcriptions of children's responses to environmental scenarios. The first step was for the data to be carefully read through to familiarize the researcher with the children's emotional engagement and awareness of environmental issues. Afterward, a process of coding was employed, where each response

was broken down into smaller units and assigned labels based on key themes, such as emotional responses, proposed solutions, and awareness of environmental problems. For example, statements that expressed sadness or concern about pollution were coded as emotional reactions to environmental harm.

Once the data was coded, similar codes were grouped to identify recurring patterns in the children's responses. This process allowed forming broader thematic categories that captured different dimensions of their understanding and engagement with environmental issues. For instance, "Environmental Concern and Empathy" emerged as a theme that encapsulated the children's emotional responses to pollution and environmental degradation, such as feelings of sadness or distress when discussing water pollution or deforestation. "Responsibility and Action" emerged as a theme reflecting proactive behaviours, where children expressed a desire to take responsibility for the environment, such as picking up trash or teaching others to be more environmentally conscious. Other themes, like "Fear and Safety", were identified from responses in which children expressed concern about the dangers of environmental hazards, such as fires, while "Emergency Response and Advocacy" captured responses where children suggested actions or interventions, such as calling emergency services when witnessing a fire.

Throughout the analysis, SLT guided the interpretation of the children's responses. SLT emphasizes the role of observational learning, imitation, and modelling in children's development, and this framework helped in understanding how the children's emotional reactions and suggested solutions might be influenced by what they had observed in their communities, the media, or from adults around them. For example, the children's desire to call for help or pick up trash could reflect learned behaviours from seeing others take similar actions. Ultimately, the themes in Table 1 "Environmental Concern and Empathy," "Responsibility and Action," "Fear and Safety," and "Emergency Response and Advocacy", were derived from a careful process of coding, pattern identification, and interpretation through SLT. Each theme represents a distinct aspect of the children's understanding and emotional engagement with environmental concerns, shedding light on how they perceive and respond to environmental challenges.

Results

The results, presented in Table 1, outline the outcomes of our study on children's responses to the environmental scenarios illustrated in Figures 1 and 2. These results are organized into themes to clearly structure and illuminate various dimensions of the children's reactions, focusing on their environmental concern, empathy, and proactive behaviours. The categories highlight the children's awareness of environmental issues, their emotional responses, and their proposed solutions to pollution and safety concerns. Direct quotations from the children offer valuable insights into their perspectives, revealing their understanding of the scenarios and their thoughtful strategies for addressing environmental challenges. This structured presentation emphasizes their empathy and advocacy for environmental stewardship, showcasing their active role in conservation efforts.

TABLE 1 Children's Responses to Environmental Scenarios in Figures 1 and 2

THEMES	*QUOTATIONS*
Environmental Concern and Empathy	Child 1: "I get sad and frustrated when people throw trash in the water, and it makes it all yucky, and the fish die."
	Child 2: "I feel upset when I see the beach covered with a lot of trash. It's harmful to fish, and the water becomes dirty."
	Child 3: "It worries me when the water gets dirty because it makes the fish sick."
Environmental Concern and Empathy/Responsibility and Action	Child 1: "I feel really sad because we won't see the fish again."
	Child 2: "I'm angry at people who left the trash. It's not right to litter. I feel upset about the fish not being able to get back into the water."
	Child 3: "It makes me sad that the fish cannot get back into the water."
Responsibility and Action	Child 1: "I am determined to tell people not to throw trash in the water."
	Child 2: "I feel a strong sense of responsibility to clean up the beach and pick up all the trash to prevent it from going into the water."
	Child 3: "I care about keeping the water clean for the fish, so I always throw my trash in the bin."
Fear and Safety	Child 1: "It makes me sad and scared when there's a big fire on the street, and it's really smoky."
	Child 2: "I feel upset because the street is all messy with tires on fire."
	Child 3: "I'm get scared when I see tires on fire.
	Child 2: "The smoke from burning tires makes me really scared. The air gets dark and hot near the fire, and it's dangerous for children."

Emergency Response and Advocacy	Child 1: "I get scared because of the fire." Child 2: "I don't like the smoke because it makes the air bad, and it can make you sick." Child 3: "The fire scares me because it can burn people, and the smoke is not good." Child 2: " It makes me worried because the air gets dirty, and we can get sick." Child 2: "I'm get scared that if I get sick, I can die and go to heaven and come back to earth as a zombie."  Figure 2 Child 3 expressing their emotions
Environmental Consciousness and Advocacy	Child 1: "I feel this is an emergency and we should call the police when there's a big fire." Child 3: "I feel that if we can call the firefighters, they will be able to put out the fire Child 2: "It is our responsibility as children to tell the grown-ups to stop burning tires as it is destroying our environment."

In Figure 1, children demonstrated a keen awareness of environmental pollution and its consequences. They expressed their emotions and proposed practical solutions, reflecting a sense of responsibility both individually and collectively. Child 1 highlighted their emotional response, stating, "I get sad and frustrated when people throw trash in the water, and it makes it all yucky, and the fish die." This sentiment underscores their concern for pollution's impact on marine life. Child 2 echoed this concern, stating, "I feel upset when I see the beach covered with a lot of trash. It's harmful to fish, and the water becomes dirty," indicating emotional distress caused by pollution. Child 3 added, "It worries me when the water gets dirty because it makes the fish sick," emphasizing their awareness of pollution's health implications for aquatic ecosystems.

Moreover, the children in Figure 1 expressed a range of emotions, including sadness and anger towards pollution. Child 1 remarked, "I feel really sad because we won't see the fish again," revealing the emotional impact of environmental degradation on their psyche.

Child 2 articulated their anger, stating, "I'm angry at people who left the trash. It's not right to litter. I feel upset about the fish not being able to get back into the water," illustrating their emotional response to irresponsible behavior harming nature. Child 3 expressed sadness, saying, "It makes me sad that the fish cannot get back into the water," showing empathy towards marine life affected by pollution.

Regarding preventive actions, the children advocated for education and communication to address environmental issues. Child 1 asserted, "I am determined to tell people not to throw trash in the water," reflecting their proactive stance in promoting responsible behavior. Child 2 demonstrated a strong sense of responsibility, stating, "I feel a strong sense of responsibility to clean up the beach and pick up all the trash to prevent it from going into the water," emphasizing their commitment to environmental stewardship. Child 3 emphasized proper waste disposal, saying, "I care about keeping the water clean for the fish, so I always throw my trash in the bin," highlighting their personal responsibility in maintaining environmental health.

In Figure 2, the responses of the children revealed a heightened awareness of environmental pollution and safety concerns related to burning tires. Child 1 expressed fear and concern, stating, "It makes me sad and scared when there's a big fire on the street, and it's really smoky," indicating their emotional response to hazardous environmental conditions. Child 2 echoed this sentiment, remarking, "I feel upset because the street is all messy with tires on fire," illustrating their emotional distress caused by environmental hazards. Child 3 voiced their fear, stating, "I get scared when I see tires on fire," revealing their emotional response to dangerous situations.

Moreover, the children in Figure 2 expressed concerns for safety and health implications of burning tires. Child 2 articulated their concerns, stating, "The smoke from burning tires makes me really scared. The air gets dark and hot near the fire, and it's dangerous for children," highlighting their awareness of safety hazards associated with environmental pollution. Child 1 expressed fear, saying, "I get scared because of the fire," emphasizing their emotional response to hazardous environmental conditions. Child 2 also addressed air quality concerns, stating, "I don't like the smoke because it makes the air bad, and it can make you sick," indicating their awareness of health risks posed by environmental pollution. Additionally, Child 3 expressed imaginative fear, stating, "I'm scared that if I get sick, I can die and go to heaven and come back to earth as a zombie," illustrating their unique perspective on environmental hazards.

In terms of proposing practical solutions, the children advocated for intervention and action to address environmental challenges. Child 1 emphasized the need for immediate action, stating, "I feel this is an emergency and we should call the police when there's a big fire," underscoring their call for adult intervention in hazardous situations. Child 3

expressed confidence in the authorities, stating, "I feel that if we can call the firefighters, they will be able to put out the fire," illustrating their belief in professional intervention to mitigate environmental risks. Child 2 advocated for responsible behavior change, stating, "It is our responsibility as children to tell the grown-ups to stop burning tires as it is destroying our environment," emphasizing their proactive stance in promoting environmental sustainability.

In essence, both scenarios depicted in Figures 1 and 2 highlight the children's heightened awareness of environmental issues and their emotional responses to pollution and hazardous conditions. Their concern extends beyond immediate impacts to include broader implications for ecosystem health and community well-being. The children recognize the detrimental effects of pollution and environmental harm and exhibit a strong sense of responsibility and empathy, particularly toward wildlife and their communities. Through proactive suggestions and advocacy for responsible behavior, they demonstrate commendable environmental consciousness and a willingness to take action. Whether expressing sadness over polluted water or advocating for emergency responses to fire hazards, the children actively engage with environmental issues, reinforcing the importance of preserving nature and ensuring community safety. Their responses reflect a deep sense of environmental stewardship, highlighting the value of fostering such awareness from an early age.

Discussion

As mentioned, SLT posits that individuals learn behaviours, attitudes, and emotional responses through observation, imitation, and modeling of others within their social environment (Mcleod, 2024). The findings of Our study resonate strongly with SLT, particularly concerning the emotional responses exhibited by children towards environmental issues. Understanding how children's emotions towards environmental degradation are shaped by what they observe in adults and media figures underscores the profound influence of social learning on early environmental awareness and empathy. This aligns with SLT's emphasis on the role of observational learning in shaping behaviours and attitudes, suggesting that children's empathetic responses to environmental challenges may be influenced by the behaviours and attitudes they observe in influential figures (Berenguer, 2007).

The study's findings align closely with existing research on children's environmental awareness and responses. In Figure 1, children demonstrated a profound understanding of environmental pollution and its harmful effects on marine life. This observation resonates with Ojala (2012), who also noted that children exhibit empathetic responses to environmental degradation, expressing emotions like sadness and anger towards

littering. Child 1's poignant remark, "I feel really sad because we won't see the fish again," highlights the significant emotional impact of pollution on their psychological well-being. Lee et al. (2020) further supports these findings by emphasizing children's emotional involvement in environmental issues, illustrating how these responses reflect an evolving environmental consciousness.

Moreover, the proactive solutions proposed by the children in Figure 1, such as advocating responsible behaviour and promoting education on environmental stewardship, are in close alignment with the recommendations put forth by Fletcher (2023) and Makuch et al. (2019). These scholars emphasize the critical role of nurturing children's sense of responsibility and agency in environmental conservation efforts through educational interventions and community engagement. Similarly, Cutter-Mackenzie (2014) underscores the pivotal role of early environmental education in fostering proactive attitudes towards sustainability among children. Likewise, researchers such as Omoogun (2016) and Berkowitz (2005) advocate for integrating environmental stewardship into educational curricula to empower children as active participants in conservation efforts.

Our study contributes empirical evidence on how these educational interventions translate into proactive environmental behaviours among children, distinguishing themselves from previous studies that predominantly discuss theoretical frameworks or educational strategies. Therefore, by directly observing and documenting children's advocacy and behavioural responses to environmental issues, our study enriches the literature with tangible outcomes, demonstrating the effectiveness of educational strategies in enhancing children's environmental awareness and engagement.

In Figure 2, the children's heightened awareness of safety concerns related to burning tires resonates strongly with research on children's perceptions of environmental hazards (Manisalidis et al., 2020). This highlights children's acute sensitivity to environmental risks, exemplified by Child 2's fear and concern about the health implications of air pollution from burning tires. This understanding of environmental threats mirrors findings by Lee et al. (2020), emphasizing how children cognitively process environmental risks and their implications.

While Manisalidis et al. (2020) emphasize children's perception of environmental hazards, our study adds depth by illustrating how children not only perceive but also emotionally and cognitively respond to these hazards. Child 2's fear indicates a nuanced understanding of the health consequences of pollution, contrasting with studies that may primarily focus on cognitive awareness (Alp et al., 2006; Trott, 2022). Lee et al. (2020) similarly underscores children's cognitive processing of environmental threats, aligning with the fear and concern shown by Child 2 in our study.

Therefore, the findings in Figure 2 contribute significantly to understanding children's environmental consciousness by demonstrating their emotional and cognitive responses to specific environmental hazards. This enriches the literature by highlighting the multifaceted ways in which children perceive and respond to environmental risks, integrating cognitive understanding with emotional awareness to foster a comprehensive approach to environmental education and advocacy.

Our study contributes to the growing literature emphasizing the development of children's environmental awareness and their active advocacy for sustainable practices. The findings demonstrate that children in Figure 1 exhibit a profound awareness of environmental pollution and its impacts, alongside advocating for responsible behaviour and promoting education on environmental stewardship (Fryxell & Lo, 2003). These proactive behaviours align with recommendations that stress the significance of fostering children's sense of responsibility and agency in environmental conservation efforts through educational interventions and community engagement.

These findings provide valuable insights for Early Childhood Education (ECE) teachers in creating emotionally supportive environments that address children's feelings about environmental concerns. Therefore, by fostering open discussions and emotional expressions, teachers can help children navigate emotions like sadness or fear, while promoting positive engagement with sustainability through reflective practices, storytelling, and activities. Furthermore, ECE teachers can use place-based approaches to encourage collective action by connecting children with their local environment and involving them in community projects, such as clean-ups or sustainability practices. This empowers children to take action, fosters responsibility, and promote collaboration toward shared environmental goals**.**

In essence, our study significantly enhances our understanding of how early environmental education can shape children's environmental consciousness and advocacy. Therefore, by highlighting children's emotional responses and proactive behaviours, it underscores the importance of integrating emotional engagement with educational strategies to cultivate a generation of environmentally conscious citizens. This holistic approach not only equips children to comprehend environmental issues but also empowers them to actively contribute to sustainable practices and advocate for the preservation of their natural surroundings.

Conclusion

While our study provides valuable insights into children's emotional responses to environmental issues, particularly pollution, framed within SLT, its scope is limited by the

small sample size of three children. Therefore, the findings should be seen as preliminary, emphasizing the need for further research with larger, more diverse samples.

Despite the small sample size, our study highlights how children emotionally engage with environmental challenges and emphasizes the importance of positive role modeling, open communication, and emotional resilience in shaping attitudes toward conservation. Future research could benefit from a case study approach that would allow for deeper examination of children's responses to environmental education, potentially guiding the development of more effective programmes. Our study suggests that Early Childhood Education educators can play a crucial role in fostering children's emotional engagement with environmental issues. Educators should create supportive environments where children can express their feelings, discuss environmental topics, and explore the emotional aspects of sustainability. Reflective discussions, storytelling, and place-based activities can help children connect with local environmental challenges, promoting both cognitive understanding and emotional awareness. These strategies empower children to consider practical ways they can contribute to positive changes in their communities.

A key lesson from this study is that children's emotional responses to environmental issues can serve as powerful motivators for action. Educators should offer hands-on, community-based opportunities, such as local clean-ups or sustainability initiatives, which promote environmental awareness and foster a sense of agency. These activities demonstrate the direct impact of children’s actions. Incorporating environmental education through play-based and inquiry-driven approaches deepens children's understanding of sustainability while supporting emotional and moral development.

In terms of policy and practice, our study highlights the importance of integrating emotional engagement into environmental education to encourage proactive stewardship. Policymakers should support initiatives that help educators incorporate both emotional and cognitive elements into curricula. Investing in educator training will ensure that children are not only informed about environmental challenges but also emotionally prepared to address them.

In conclusion, while our study provides valuable insights into children's emotional responses to environmental issues, further research is needed to explore how these findings can be applied more broadly. Expanding environmental education programs to include both cognitive and emotional engagement, alongside parental and media involvement, will create a supportive environment for children to develop a strong sense of responsibility. Empowering children with knowledge, emotional resilience, and practical tools will cultivate a generation motivated to contribute to a sustainable future.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Alp, E., Ertepınar, H., Tekkaya, C., & Yilmaz, A. (2006). A statistical analysis of children's environmental knowledge and attitudes in Turkey. *International Research in Geographical and Environmental Education, 15*(3), 210–223. https://doi.org/10.2167/irgee193.0

Amineh, R. J., & Asl, H. D. (2015). Review of constructivism and social constructivism. *Journal of Social Sciences, Literature, and Languages, 1*(1), 9–16.

Baker, S., Clayton, S., & Bragg, E. (2021). Educating for resilience: Parent and teacher perceptions of children's emotional needs in response to climate change. *Environmental Education Research, 27*(5), 687–705. https://doi.org/10.1080/13504622.2020.1828288

Bandura, A. (1969). Social-learning theory of identificatory processes. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 213–262). Rand McNally.

Bandura, A. (1977). *Social learning theory*. Prentice Hall.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*(1), 1–26. https://doi.org/10.1146/annurev.psych.52.1.1

Barker, A., Spackman, N., & Nancarrow, C. (2001). Informed eclecticism: A research paradigm for the 21st century. *International Journal of Market Research, 43*(1). https://doi.org/10.1177/147078530104300102

Berenguer, J. (2007). The effect of empathy in proenvironmental attitudes and behaviors. *Environment and Behavior, 39*(2), 269–283. https://doi.org/10.1177/0013916506292937

Berkowitz, A. R., Ford, M. E., & Brewer, C. A. (2005). A framework for integrating ecological literacy, civics literacy, and environmental citizenship in environmental education. In R. L. Thomas (Ed.), *Environmental education and advocacy: Changing perspectives of ecology and education* (pp. 66-84).

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.

Chawla, L. (1999). Life paths into effective environmental action. *The Journal of Environmental Education, 31*(1), 15–26. https://doi.org/10.1080/00958969909598628

Crandon, T. J., Scott, J. G., Charlson, F. J., & Thomas, H. J. (2022). A social–ecological perspective on climate anxiety in children and adolescents. *Nature Climate Change, 12*(2), 123–131. https://doi.org/10.1038/s41558-021-01251-y

Crease, A., & Singhasaneh, N. (2023). Climate change conversations with children: Making sustainability meaningful, tangible, and actionable. *Massachusetts Institute of Technology*.

Cutter-Mackenzie, A., Edwards, S., Moore, D., & Boyd, W. (2014). *Young children's play and environmental education in early childhood education*. Springer Science & Business Media. https://doi.org/10.1007/978-3-319-03740-0

Dryzek, J. S. (2022). *The politics of the earth: Environmental discourses*. Oxford University Press.

Fletcher, C. (2023, October 6). The importance of environmental education for a sustainable future. *Earth.Org*. https://earth.org/environmental-education/

Frost, N., & Dolan, P. (2021). Theory, research and practice in child welfare: The current state of the art in social work. *Journal of Social Work, 21*(1), 3–20. https://doi.org/10.1111/cfs.12824

Fryxell, G. E., & Lo, C. W. (2003). The influence of environmental knowledge and values on managerial behaviors on behalf of the environment: An empirical examination of managers in China. *Journal of Business Ethics, 46*, 45–69. https://doi.org/10.1023/A:1024773012398

Gergen, K. J., & Gergen, M. M. (2006). Social construction and the transformation of identity. In M. Wetherell, S. Taylor & S. J. Yates (Eds.), *Discourse theory and practice: A reader* (pp. 102–119). Sage Publications.

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. *The Lancet Planetary Health, 5*(12), e863–e873. https://doi.org/10.1016/S2542-5196(21)00278-3

Jones, C. A., & Davison, A. (2021). Disempowering emotions: The role of educational experiences in social responses to climate change. *Geoforum, 118*, 190–200. https://doi.org/10.1016/j.geoforum.2020.11.006

Kim, B.-J., Kim, M.-J., & Lee, D.-G. (2023). The mental health implications of corporate social responsibility: The significance of the sense-making process and prosocial motivation. *Behavioral Sciences, 13*(10), 870. https://doi.org/10.3390/bs13100870

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239–260. https://doi.org/10.1080/13504620220145401

Krathwohl, D. R., Bloom, B. S., & Masia, B. B. (1964). *Taxonomy of educational objectives: The classification of educational goals. Handbook II: Affective domain*. David McKay.

Lee, K., Gjersoe, N., O'Neill, S., & Barnett, J. (2020). Youth perceptions of climate change: A narrative synthesis. *Wiley Interdisciplinary Reviews: Climate Change, 11*(3), e641. https://doi.org/10.1002/wcc.641

Makuch, K. E., Zaman, S., & Aczel, M. R. (2019). Tomorrow's stewards: The case for a unified international framework on the environmental rights of children. *Health and Human Rights, 21*(1), 203. https://doi.org/10.5070/G314342949

Manisalidis, I., Stavropoulou, E., Stavropoulos, A., & Bezirtzoglou, E. (2020). Environmental and health impacts of air pollution: A review. *Frontiers in Public Health, 8*, 14. https://doi.org/10.3389/fpubh.2020.00014

McLeod, S. (2016). *Bandura—Social learning theory*. Simply Psychology. https://www.simplypsychology.org/bandura.html

Ojala, M. (2012). Hope and climate change: The importance of hope for environmental engagement among young people. *Environmental Education Research, 18*(5), 625–642. https://doi.org/10.1080/13504622.2011.637157

Omoogun, A. C., Egbonyi, E. E., & Onnoghen, U. N. (2016). From environmental awareness to environmental responsibility: Towards a stewardship curriculum. *Journal of Educational Issues, 2*(2), 60–72. https://doi.org/10.5296/jei.v2i2.9265

Ozturk, E. (2021). Early childhood environmental education and current trends. In *Different Perspectives on Environmental Education* (pp. 203–254).

Sauvé, S., Bernard, S., & Sloan, P. (2016). Environmental sciences, sustainable development and circular economy: Alternative concepts for transdisciplinary research. *Environmental Development, 17*, 48–56. https://doi.org/10.1016/j.envdev.2015.09.002

Schill, M., Muratore, I., & Hogg, M. (2022). Children's engagement with environmental issues. *Journal of Marketing Management, 38*(10), 1–37. https://doi.org/10.1080/0267257X.2022.2046626

Stokols, D. (2018). *Social ecology in the digital age: Solving complex problems in a globalized world.* Academic Press.

Strife, S. J. (2012). Children's environmental concerns: Expressing ecophobia. *The Journal of Environmental Education, 43*(1), 37-54. https://doi.org/10.1080/00958964.2011.602131

Trott, C. D. (2022). Climate change education for transformation: Exploring the affective and attitudinal dimensions of children's learning and action. *Environmental Education Research, 28*(7), 1023–1042. https://doi.org/10.1080/13504622.2021.2007223

Woszidlo, A., & Kunkel, A. (2017). The role of observational learning in environmental education. *Environmental Communication, 11*(4), 475–490. https://doi.org/10.1080/17524032.2017.1320282