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Research Article

Leaders of change: Children and the climate change movement

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ABSTRACT

Climate change is a global crisis associated with the increase in greenhouse gas emissions and is associated with many environmental, psychological, and health problems today. One of the problems of the past, present, and future is children's limited knowledge about climate change and their inability to take an active role as participants in the struggle. Children are the greatest pioneers of change, and their ability to change the world is undeniable. Children need to know the facts about climate change, make their voices heard in climate crisis management, and be involved in the struggle. In this regard, it is crucial to conduct various sustainability trainings and activities, both in school and after school, using effective communication strategies. These strategies should include explaining and conveying climate change using positive language, utilizing methods such as localization, visualization, and storytelling with children. In the meantime, it is very important that educators, families, and society also gain awareness and become equipped about climate change, and that children take responsibility and become active participants, because the fight against climate change is intergenerational and climate change has mutual effects on attitude and behavior change. The scope of this review is to examine the role of children in combating climate change and to compile literature studies and real-life examples to understand the importance of the subject. This study will make an original contribution to different communication strategies and educational programs that present solutions to the climate crisis, as well as lead the way for families and communities to guide children.

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INTRODUCTION

The climate change challenge, which is primarily caused by greenhouse gases and land use, can directly constrain the availability of raw material resources, lead to food insecurity, and consequently have adverse impacts on public health. These implications can arise from both the deterioration of the environment and financial meltdowns [1,2]. For example, Springmann et al. [3] predict that climate change-related deaths attributable to food insecurity alone will reach 529,000 by 2050. Children are experiencing the effects of climate change in the form of asthma [4], atopic

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dermatitis [5], and allergies [6]. Additionally, due to their awareness of the destructive effects of climate change and extreme weather events such as hunger and food insecurity, water scarcity, and emerging diseases [7], and growing up in uncertainty, children also experience anger problems due to their knowledge about this issue and have less effectiveness in finding solutions due to their helplessness, anxiety, and fear [8]. The results suggest that early childhood exposure to climate change impacts is also associated with lifelong migration, possibly for psychosocial reasons [9]. Furthermore, it is worth noting that young children may exhibit distinct thermoregulation mechanisms compared to adults, rendering them more susceptible to variations in ambient conditions. Hence, it is advisable to engage young children in everyday activities to promote sufficient physical fitness and enhance their immunity and psychological well-being [10].

Governments also play a crucial role in implementing policies that address climate change and adequately prioritize the interests of children [11]. Despite their perceived vulnerability to climate change, children actually contribute significantly to sustainable living as part of the biosphere [12]. Children are endowed with excellent adaptability and are considered change agents with curiosity for exploring the future, environmental consciousness, and the potential to spread it around, making them valuable leaders in addressing the climate change crisis [13,14]. Therefore, an approach that evaluates children as change leaders in climate change crisis management will advance societies [15], focusing on fostering their sense of ownership and responsibility rather than concealing the reality of climate change from them. The need for children to have a voice in climate crisis management, to showcase their talents, and to be involved in world organizations should not be ignored [16]. Moreover, children's involvement in the fight against climate change can influence adults' behavior, emotions, and actions on climate change [17].

As evidence of the importance of children and youth in combating climate change, the United Nations hosted the "Youth Climate Summit" in 2019. At this summit, young climate advocates between the ages of 18 and 30 explored ways to fulfill the commitments of the Paris Agreement and provided a platform for them to discuss their ideas with peers and world leaders [18]. In Africa, there are projects and organizations focused on raising awareness and consciousness among youth about climate change, as well as initiatives for climate action among youth, such as training young farmers and agricultural experts in combating climate change through initiatives like the "Climate Smart Agriculture Youth Network" [19–21]. Additionally, there are various educational programs [22], environmental art and craft activities [23] targeting younger children, and initiatives such as Eco-Schools [24] and Nature Play [25] aimed at raising awareness about climate change and sustainability.

This review focuses on the role children play in climate change, analyzing what kids know and perceive about climate change, the communication strategies used to raise awareness and its impact, and successful communication methods on climate change. It also focuses on school and community-based climate change education programs, campaigns, and events for children, and finally, how parents and educators can educate their children about climate change. This review is important because it shows that children play a key role in the fight against climate change, demonstrates the importance of successful communication strategies and education, and creates effective plans to raise awareness and fight against climate change today and in the future.

The objective of this article is to examine the role of children in efforts to tackle the climate crisis, review literature and real-life examples to understand and communicate the importance of the subject to readers and raise awareness of the need for children to take responsibility for community action. Furthermore, this review is constructive in terms of different communication strategies, educational programs, and the role of parents and communities in engaging children in the struggle with climate change.

Awareness and Communication Strategies for Children About Climate Change

Although children are sometimes characterized as naive, innocent, and passive, they should be seen as the creators of the future and agents of change. Scientific research on children should be accelerated, and efforts to support their development should be increased [26]. Numerous studies should be conducted to understand what children know about climate change and how they perceive it. Effective communication methods should be utilized to address their concerns, such as helplessness, anxiety, and fear, and to provide accurate awareness about climate change. Children should be pedagogically guided to deeply understand the concepts of sustainability, climate change, and global warming and to effect change. Their relationship with family, school, and society should be determined, and they should be encouraged to learn [27].

It was observed that children's evaluation of environmentally harmful actions varied according to their age group and their judgments about environmental damage varied according to the target victim (tree, plant, animal, etc.) [28]. Hahn & Garrett [29] emphasize in their research that early children evaluate actions that harm the environment as morally wrong and that moral judgments change between the ages of 3 and 4. Therefore, effective communication methods and climate change education are very important in changing the environmental behaviors and attitudes of early children. These effective communication strategies include localization [30], visualization [31], storytelling [32], and the use of positive and inspirational language [33]. However, in the future, it will be critical to identify and diversify specifically effective environmental

education components and approaches, as well as broaden the scope of targeted environmental behaviors [34]. To support children's participation in the climate challenge, it is necessary to identify communication strategies that promote peace and equality, hope, and a determined action plan to protect children, prioritize children, and leave them with a better future [35].

Given the complexity of comprehending and acquiring knowledge about climate change, particularly during early childhood, it is possible to explain the concept to children by emphasizing ecology and pro-environmental topics. Young children can engage in localization activities through interactive games that emphasize culture, nature, and practical problem-solving. These activities aim to enhance their understanding of climate change in a precise and accessible manner [36]. Studies have shown that it is important to establish local and place-based connections and transfer them to children and use nature-based materials, both in terms of climate change and age-appropriateness [37]. Art has the potential to guide children and support meaning-making through photography, visualization, and metaphor-making [23].

An art-based 15-week after-school program for children to strengthen their climate change sensitivity and activism was examined [38]. This program utilized ecosystems, climate-weather, and climate change education, along with outdoor activities and the photovoice process, to assist children in comprehending the challenges and potential solutions to local issues. At the end of the program, it was observed that the children gained awareness about sustainable transformation, had fun, especially with various teachings and games, and realized their activist skills. Post humanist studies that aim to connect children with nature and raise awareness about climate change focus on the concept of ecological aesthetics [39]. For instance, within the scope of the Climate Change and Me project, children and young people in New South Wales, Australia, took photographs to express their feelings about climate change. This study analyzed children's photographs, demonstrating the application of aesthetic framing and demonstrating how childhood experiences can reveal the potential for new environmental thoughts and behaviors [40].

One way to transition the concept of climate change from problem-based to action-based is to present a wide range of stories of people taking positive action, because the ability to take actions is the precursor to a movement, and presenting real stories to the public is thought to be much more effective for community action [41]. Hence, modern storytelling techniques are considered a creative way to interest children and influence their environmental behavior and sustainable attitudes [42]. In early environmental education, digital storytelling is also believed to stimulate children's emotions [43]. In a study, it was observed that children who were presented with positive role models through stories before playing showed more sustainable behavior during play [44]. Hahn & Garrett [29] also demonstrated in their study that the behaviors of fictional characters in books morally influence children's environmental behaviors and shape their future behavior patterns. The main reasons for this can be attributed to the triggering of emotional connection and empathy in readers through storytelling and the use of a collective discussion approach that is compatible with cultural characteristics [45,46].

Games developed on environmental and climate change issues allow children to visualize the effects of climate change and encourage environmentally sustainable behaviors [47]. A study in a Ukrainian school concluded that playing climate change games with children directly increased their understanding of climate change threats and solutions [48]. Alternative reality games, social media, and games connected to the real world are effective and innovative strategies used in communicating climate change [49]. Games emerge as a standalone motivational tool for combating climate change because they utilize entertainment to reach a wide audience [50]. One example of games designed for young children is Éco Héros, which allows children to protect their animals, engage in forest-friendly crafts, and safeguard marine animals from pollution within a digital game environment. Games such as Fate of the World and Anno 2070 are cited as examples of games focusing on environmental sustainability and climate change, where players simulate the effects of climate change and gain knowledge about topics such as renewable energy sources [51].

These effective communication strategies are critical not only for children's perception and learning about climate change but also for enabling children and youth to voice their concerns about climate change to the world and express themselves properly. One of the most significant examples of the role of children and youth in climate change is Greta Thunberg, who initiated the'school strike for climate' in front of the Swedish parliament in 2018. The event received a variety of positive and negative reactions from society and sparked widespread discussions on social media and various communication channels, with debates on this issue still ongoing [52]. Greta Thunberg's impact on rewriting the roles of children and young people in climate change is inevitable, but the communication language she used has also led to her being the target of criticism. It is clear from this incident that while conducting climate change education and awareness-raising activities for children, the communication strategies and language of the educators are also very important so that the child will tend to communicate in a similar way. In addition to educators, the communication strategies and language used by activists also hold significant importance. Greta Thunberg's inconsistent use of English and Swedish in her speeches can be interpreted as communication errors and misunderstandings. Additionally, her over-dramatization of her speeches has led to negative and pessimistic thoughts among the public, which contrasts with her positive and inspirational approach. Nevertheless, it is an inescapable fact that this event has helped raise global awareness and put pressure on

politicians, so Thunberg's courage and determination have elevated the role of children and young people in climate change to a new level [53,54].

Education and Awareness-Raising Programs

Education programs and activities on climate change, the environment, and sustainability should start at an early age in order to combat climate change, raise awareness in society, ensure that it is permanent and long-term, and leave a sustainable planet for future generations. Thanks to global initiatives such as the UNESCO Education for Sustainable Development Vision [55], which combines children's curiosity about living things with education, and national political support such as the Early Years Learning Framework for Australia [56] early years sustainability education is gaining momentum worldwide, and recently, in December 2023, at the Dubai Conference of the Parties (COP) 28 [57], was carried out and decided to transition to a greener education. When education on combating climate change is started at a young age, especially, it shows that children who grow up in close contact with nature become individuals who are aware of their responsibilities towards the environment and exhibit environmentally friendly and respectful behaviors towards nature in their later years [58].

Exposure to nature is often associated with a greater awareness of environmental harm [28]. Therefore, it is essential to integrate nature-based education with basic subjects such as literacy and mathematics in order to promote both sustainable living and ethical practices in the face of the climate change crisis [59]. Ginsburg & Audley [59], conducted a study on the content of sustainable education in a nature-based preschool in the Northeast region of the United States and the behavior of teachers towards children. As a result of the research, it was emphasized that it is important for children to receive sustainability education in nature and to integrate the water cycle, trees and nature with literacy and mathematics skills. However, it was reported that the education given to children should not be limited to school, there is a need for political and cultural systemic change, and in this way, permanent learning can be achieved in the fight against climate change. Children who participated in an after-school activity intended to promote children's behavior regarding climate change and the environment at the household and community levels reduced their energy consumption and waste and shared their knowledge of climate change with their family and other kids their age, thereby facilitating intergenerational learning, according to a study [60]. In their study, Jones & Davison [61] emphasized that climate change education should not only involve learning facts but also encompass children's emotional responses. This is because children's learning pathways focus on sensory and emotional perceptions, unlike adults' abstract and logical ways [62]. It was also underlined that emotions related to climate change should not be categorized as positive or negative, and that children should be allowed to experience a variety of emotions on this issue. According to another study [63], educating young children to observe the weather every morning in schools and experience how their clothing and outdoor play routines can alter based on the weather, thereby linking human and weather events with sensory and affective effects, serves as an educational strategy to counteract and increase awareness of the impacts of climate change. The idea that accessible information can only become permanent through emotion informs this approach.

Successful education and awareness-raising of children about climate change are associated with appropriate educational methods, as well as educators possessing adequate knowledge, skills, and metacognitive and pedagogical abilities in environmental, sustainability, and climate change issues [64]. All teachers and school administrations have responsibilities beyond merely educating students; they should also create environments for discussions on climate change, make students feel empowered to make a difference, and promote student activism and interstudent communication and connections [15]. It is important to note that educational methods and communication strategies may also vary according to the cultures of educators and children. For example, in a study examining early childhood sustainability education in Japan, Australia and Korea [65], Australian and Korean educators focused on conservation of natural resources and environmental issues, while Japanese educators were reluctant to do so. The study also highlighted the importance of globalizing sustainability education and providing educators with standardized, quality, and professional training on climate change. A study of pre-school and primary school teachers in Greece found that gender and age affect educators' performance and environmental attitudes, that they mostly use the media to learn about environmental issues, and that school curricula are incomplete [66]. Although the importance of climate change is evident in research, there is still a need for research and support for climate change education and awareness-raising programs due to limited programs to train educators at the appropriate level, insufficient time allocated to climate change, superficial coverage of climate change issues, and a lack of adequate financial and moral support [67]. Educators should have access to professional development opportunities that foster a deeper understanding of sustainability and its implementation in the school environment. These opportunities should extend beyond merely spending time in the garden or relying solely on books for instruction, but should also introduce more innovative ideas [65].

The Role of Family and Community

Children and families play an important role in creating conscious, fair, and peaceful societies [27]. Children's attitudes and actions towards mitigating climate change are influenced by changes in their daily activities within the family and the debates they observe within the family and in society [60]. The environmental perspectives of

parents or other family members have a significant impact on children's comprehension of climate change and future actions because family decisions impact children and children mimic their parents' education and worldview [14]. Moreover, not only the family influences the children, but also the children influence the family, as evidenced by the fact that children have been shown to influence parents' views on gender orientation [68]. Therefore, communication between family and child is very important and they influence each other through intergenerational learning.

Active listening, demonstrating empathy, spending meaningful time together, imparting problem-solving skills, maintaining transparency and honesty, and setting clear boundaries are the foundations of effective communication between families and children [69–71]. Raising awareness and educating children about climate change can be challenging for families, but mutual benefits can be achieved through various activities, such as the whole family participating in gardening projects together, caring for plants at home, consuming food grown by the family, recycling at home, and encouraging the reuse of recycled materials [27]. Furthermore, researchers determined the impact of The Little Explorers Playgroup, an Australian playgroup that allows children and parents to participate together, on their environmental attitudes and behaviors. The study found that parents and children who participated in the playgroup exhibited stronger environmental attitudes, behaviors, and responsibilities than those who did not [58].

Every action in society has a vital role in promoting intellectual curiosity among children and young people, increasing their knowledge of the urgent requirement to address climate change, and empowering them to take on socio-political responsibilities [72,73]. As emphasized in the rest of the article, there is intergenerational commitment in the fight against climate change, and studies underscore the importance of children making real and potential contributions to creating sustainable futures [74]. Encouraging children and young people to play an active role in climate change movements, strikes, and organizations to combat climate change, and ensuring that their voices are heard by the government and society—all these actions seem to increase and decrease the feelings of hope and optimism for the future in children and even adults [75]. For instance, Plant-for-the-Planet is an organization that began in 2007 as a fourth-grade school project with the goal of planting 1 million trees in every country, where children around the world work to plant forests and stop deforestation [76]. School strikes and the Fridays for Future movement that have occurred around the world since 2018 also enable children and young people to actively participate in society [77].

CONCLUSION

Climate change is one of the most fundamental problems of today and the future, and it requires an urgent action plan. Sustainable development plans and actions continue to be implemented worldwide to support efforts to use renewable energy resources and reduce greenhouse gas emissions in the fight against climate change. However, children, as future creators, also play an important role in this struggle to make these scientific, social, and awareness studies permanent. Fostering an early education that educates children about climate change and cultivates a sense of accountability regarding this matter will establish a foundation for subsequent generations to inhabit more environmentally conscious societies. Providing children with education about climate change and fostering a sense of responsibility from an early age will pave the way for more informed societies and sustainable environments for future generations. Children can learn about sustainability through various communication strategies like nature-based education, books, and games. In this process, educators, families, and society play a crucial role, and effective communication with children requires a solid foundation in sustainable practices. Raising awareness and educating children about climate change opens the door for them to take action towards a sustainable future. This movement can also occur through changes in their attitudes and thought processes within the home, as well as through their contributions to global reforestation efforts or future career choices. Therefore, it is crucial to establish climate change communication in children, implement effective communication strategies, and provide them with relevant training, as the lessons they learn at a young age will shape their future. In addition, it is anticipated that awareness will increase among parents and society who witness children's struggle with climate change due to intergenerational commitment. It is recommended that sustainability practices be expanded and repeated with innovative perspectives in order to obtain more accurate results about the role of children in climate change and the training provided. Lastly, it is crucial to adopt an international approach and raise local people's awareness in children's climate change awareness studies, as well as in all social organizations in which children participate

AUTHORSHIP CONTRIBUTIONS

Authors equally contributed to this work.

DATA AVAILABILITY STATEMENT

The authors confirm that the data that supports the findings of this study are available within the article. Raw data that support the finding of this study are available from the corresponding author, upon reasonable request.

CONFLICT OF INTEREST

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ETHICS

There are no ethical issues with the publication of this manuscript.

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