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Research article

# Identifying environmental education strategies for children with an emphasis on children under four years old: A qualitative study in Iran

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ABSTRACT

*Background:* Environmental crises, on the one hand, and the impact of environmental protection education from childhood, on the other hand, have focused on the need for environmental education in early life, which tries to teach the concept that humans can live in harmony with nature. Therefore, this study aims to identify environmental education strategies for children with an emphasis on children under four years old in Iran.

*Methods:* The study was conducted using a qualitative method and through interviews with 14 experts and practitioners with ability and knowledge in environmental education for children. The text of the interviews was analyzed using the content analysis technique and MAXQDA-2018 software.

*Results:* Based on the study results, 216 codes were presented in the form of 15 subcategories and five main categories. The results showed that child empowerment, indirect education of the child, production of relevant content and reviewing existing content, environment-oriented socialization, and creating appropriate infrastructure are basic strategies for teaching the environment to children.

*Conclusion:* it is necessary to revise policies, interventions, and educational programs. For education to be effective for children, it is better to provide suitable conditions in both the individual and structural dimensions and the education should be done indirectly. Additionally, promoting a positive attitude towards the environment through the design and implementation of community programs can be beneficial.

## 1. Introduction

Environmental education focused on the early childhood is experiencing positive growth in research due to persistent

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environmental crises [1]. The environmental crises because of the, but not limited, changes those human beings make in the environment and ignorance about environmental issues in line with the growth of individualism, the extravagance of the capitalist world, and the misuse of nature are increasing [2]. In addition, another part of environmental crises is rooted in the lack of necessary knowledge and cultural weakness in the relationship between man and nature [3,4]. Many note that protecting and restoring the environment will require crucial changes in human attitudes and behaviors through education [5]. Environmental education should change the social and ethical norms through changing the knowledge, awareness, skill, attitude, and participation [6].

Environmental education believes that human beings can live in harmony with nature and, in this regard, can make conscious decisions that also consider future generations [7]. Therefore, strengthening the culture of environmental protection is an essential step in dealing with these crises [8] and, it must be learned from childhood [8,9]. Since the formation of environmental attitudes, skills, values, and commitments starts at a young age [2,9], educating children about the environment and introducing pro-environmental behaviors will be a crucial step toward achieving long-term environmental sustainability [10]. Although environmental education is relevant throughout the life course, from infancy through the elderly [11,12], early childhood is identified as a particularly vital time for developing environmental literacy [13,14]. Theories of environmental education are focused on situated and constructivist learning and the need for direct participation of children [15]. It has been pointed out in previous studies that environmental education theory and research have overlooked the children who are the subjects of environmental education [16,17]. Under four years old as first period of early childhood, is one of the most critical ages for children to learn and be educated to properly communicate with the environment and surroundings outside the home [18,19]. This children's life period should be spent exploring the environment with all their being, trial and error, and using all the senses [20]. The logic that a child achieves is objective and depends on the context in which he or she observes and internalizes behaviors and patterns of behavior [21].

Previous studies reported a low level of environmental education in early childhood, and this level is even smaller when it comes to preschool and under 4-year-old children [22,23]. As a result, it is imperative to provide solutions to prepare the child for forming relationships and provide a suitable environment for socialization. Therefore, appropriate and strategic programs should be designed to increase the effectiveness of environmental education for children. On the other hand, these programs should be based on scientific studies and field research. To date, research on children's environmental education has focused on school-aged children,n and these programs for children have been implemented in formal, school-based settings [24]. By searching in the previous studies, no specific study was conducted to educate children under four years old.

In addition to the stated necessity, a similar study has not been conducted in Iran. However, the environment of Iran a low-middle-income country with a unique geopolitical position [25], is constantly changing in recent years [26]. This reason encouraged the authors to conduct the present study. Due to the importance of environmental education for children and the lack of comprehensive studies in this field, the study used qualitative methods, including interviews with experts and stakeholders, to this study aims to identify environmental education strategies for children with an emphasis on children under four years old in Iran. The main research question is this: What are the environmental education strategies for children under four?

## 2. Methods

### 2.1. Design and participants

This study conducted a qualitative research method using conventional content analysis of the interviews with experts, university professors, and those working in environmental organizations. The research field was Iran in 2021, and the study population consisted of all specialists, university professors, and those working in organizations related to children's environmental education with sufficient and relevant knowledge or executive experience.

### 2.2. Data collection

Data were collected through semi-structured interviews with 14 experts, considering the criteria of authorship or having research in the fields of children and the environment, being an expert and having knowledge and experience on the subject, and willingness to participate in research. Interviews were conducted in person and by telephone based on the interviewee's preferences. Data were collected using an interview guide by first and second authors between October and February 2021. Purposeful and snowball sampling were used to select the interviewees, and theoretical sampling to identify the number of participants, determine the location of the required data, and find the research path. Theoretical sampling is a method of selecting samples based on the results of data collected to gain a deeper understanding of the rationale or development of theories. Particular cases may be chosen to maximize the probability that a phenomenon will be observed. The use of this type of theoretical sampling method in the present study was such that after each interview and data analysis, based on the results, we decided who should be interviewed and what points to focus on in the interview questions with the next participant to draw the theoretical path specified in the research in a better way. This type of sampling with a variety of information causes the nature and different dimensions of the phenomenon to be better studied and analyzed [27]. In this regard, to achieve maximum diversity in the data, an attempt was made to select samples from experts with different specialties related to the subject of study. For this purpose, the research team first identified the experts and then compiled a list of these people according to their knowledge and experience. The list was prioritized by purposeful, snowball, and theoretical sampling and observing the dispersion principle. To this end, the research team searched reliable scientific databases such as PubMed, Web of Science, Scopus, and Google Scholar search engine, and the list of faculty members who had scientific articles published in reliable journals about environmental education was identified. At this stage, 11 experts in this field were identified for interview by reviewing resumes. Later,

**Table 1**
Interview question guide.

| No | Questions |
|---|---|
| 1 | To what extent and in what ways do environmental crises affect children? Are these crises controllable? |
| 2 | How do you assess the relationship between the child and the environment? Do we need to inform the child about this relationship? |
| 3 | How do you think the importance of the environment can be explained to the child? What suggestions are you for institutionalizing the child's attachments to nature and the environment? |
| 4 | In your opinion, how and through whom is environmental education better for children under four? Please share the successful experiences of other communities in educating the environment and improving children's relationships with the environment. |

participants were contacted via email or phone call and asked to participate in the research, and the time and place of the interview were determined by them. After stating the purpose of the study and coordinating with the experts, two of the experts did not have enough time and desire to cooperate. The interview continued with nine other people. At the end of the interview, they were asked to introduce other eligible researchers to the researchers. At this stage and based on experts' suggestion, seven more people were selected for interview. In the next stage, the interviews with these people continued until the data was saturated.

Interview question guides (Table 1) were used to direct the research and identify children's environmental education strategies. Hence, interview questions were prepared in consultation with the research team and experts. Also, three test interviews were conducted to ensure that the interview questions could extract the desired information from the participants. The question guide was edited and completed after coding and analyzing these three interviews. In general, the average duration of the interviews was 60 min, with a minimum of 25 and a maximum of 90 min. In-person interviews were conducted following health protocols and in the campus and work environments of the participants. All interviews were recorded with the consent of the participants. Interviews continued until reaching data saturation. Data saturation refers to the point in the research process when no new information is discovered in data analysis. On the other hand, other data were repeated and the continuation of interviews did not add new information to the study [28]. In face-to-face interviews, written consent, and the interviews by telephone, oral consent was obtained from the participant to record and use quotations.

### *2.3. Data analysis*

The data analysis process was performed using the qualitative content analysis technique conventional and proposed steps of Graneheim and Landman [29] and with the help of MAXQDA-2018 software by the first and third authors of the article. In the first step, the researcher transcribed the interviews using Word 2017 software immediately after the first interview and on the same day with the help of other research colleagues. In the second step, the text of the interviews was read carefully by the researchers three times to get a general understanding of their text. In the third step, all the texts of the interviews were read line by line and word by word with great care and patience, and the initial codes were extracted. In the fourth step, the researchers subcategorized the codes that were similar in meaning and concept and could be placed in a category and determined how they related. In the fifth step, the codes and categories were placed in the main categories, which were more comprehensive and abstract. Finally, in a joint session, the entire data analysis process was shared, and the opinions of all the article's authors were used.

### *2.4. Trustworthiness*

The quality of research was increased by observing Lincoln and Guba's criteria [30]. Also, 32 items of the qualitative research report of Tong et al. were observed [31]. As both the researchers and interviewees were experts in the subject under study, it helped the researchers gain the trust and confidence of the participants. Furthermore, to enhance the credibility of the qualitative research, considerable time was spent on data collection, data analysis, data immersion, diversity of participants' demographic characteristics, and checking the researcher's overall perception of participants' mentions at the end of the interview. All the authors were involved in the coding and analysis of the article, and they all shared their thoughts in the meetings to eliminate biases among researchers (Conformability). Participants were asked to voice their thoughts on the research findings, which they eventually endorsed. In addition, the data analysis and findings were transmitted to three top qualitative researchers, who corroborated the analysis and findings (Dependability). Finally, the participants' citations were given out in huge quantities and directly after a detailed description of the entire research process. The study findings were also shared with seven people who had identical conditions to the study participants but were not present in the study, and they confirmed that they had similar experiences (Transferability).

## 3. Results

The present qualitative study was conducted with the participation of 14 specialists, university professors, and those working in organizations related to the environment and children's education (Table 2). 216 codes were classified into five main categories and 15 subcategories (Table 3).

**Table 2**
Demographic information of participants.

| NO | Specialty | ranks | Sex | Age |
|---|---|---|---|---|
| 1 | Psychology | Assistant Professor | Female | 39 |
| 2 | Preschool counseling | Researcher and activist | Female | 41 |
| 3 | Environment | Associate Professor | Male | 55 |
| 4 | Child education | Assistant Professor | Female | 35 |
| 5 | Child counseling | Researcher and activist | Female | 45 |
| 6 | Psychology | Professor | Female | 57 |
| 7 | Health and environment | Researcher and activist | Male | 43 |
| 8 | Child study field | Professor | Male | 65 |
| 9 | Social policy | Associate Professor | Female | 64 |
| 10 | Child counseling | Researcher and activist | Female | 52 |
| 11 | Environment | Researcher and activist | Male | 61 |
| 12 | Sociology | Professor | Male | 58 |
| 13 | Consulting | Assistance Professor | Male | 40 |
| 14 | Sociology | Associate Professor | Female | 36 |

## 4. Child empowerment

Based on the interview analysis, the child empowerment strategy was identified, which is learning without formal education, where a child learns based on his or her natural abilities and experiences in the environment. In this sense, we can rely on the child's learning potential and improve teaching effectiveness using indirect techniques.

**The child's direct connection with nature and its elements.** Learning based on the child's experience in the heart of nature is another part of effective learning for children. Children enjoy accomplishing things by trial and error and learning from their mistakes. In this sense, it is critical to avoid formal schooling, which is incompatible with the nature of a child's learning. Instead, one should recognize the value of a child's intuitive experience and the nature of his or her love for learning and focus the child's learning behaviors toward his or her natural friendly inclination. In this regard, it is preferable to increase children's direct contact with nature and its elements for them to be able to touch the details with all of their senses and connect with them more effectively.

> "Most children learn by trial and error; they touch, pick up, weigh, and assess the roughness and softness of the objects. A child wants to cut a strip of adhesive tape; the first time he/she catches the tape, he may grab more than is needed; for example, he/she may pull 20 cm instead of 5 cm, not realizing that this much tape is not necessary. In the next stage, it works well, and he/she pulls less and less … You can observe that the child is investigating and learning while cutting a piece of sticky tape (Interviewee No. 6)."

> Children are in no way teachable by nature and are adamant about not being educated. The youngster wishes to learn on his or her own, but what can the school do? It all starts with paying attention in school. It begins with schooling that does not cultivate love (Interviewee No.8)."

> " …… We have reached the era of modernity, but our species has remained unchanged for millions of years, as have none of our intrinsic features." Just as a child 200,000 years ago needed to engage directly with the components of nature to learn, so must a child now. As long as the child does not touch things, we may believe he or she is injuring the animals or objects. However, the main reason for this touch is that they cannot understand the creatures coherently unless they interfere with them (Interviewee No.12). "

**Assignment of roles.** Indirect, creative, and informal education are standard approaches for teaching children about the environment. The provision of eco-friendly practical activities involves the child participating in activities in which he/she assumes responsibility and takes an active role. Indirectly planned messages, using the child's interest and curiosity to learn, teach children appropriate environmental behaviors. Assigning roles to children can help them become environmentalists.

> "Indirect tutorials and games like slicing fruit peels, watering flowers, and planting plants are implicit but intentional tutorials (Interviewee No.2)."

> "When children plant a seed, they unwittingly internalize a few things for themselves, which they later learn, such as self-confidence, self-esteem, and so on. After they plant the seed themselves, from the beginning until it wants to grow and bear fruit, they must pay attention to three things: water, soil, and air. So, children understand the meaning of healthy soil and soil maintenance. They understand that the soil is not to be contaminated … (Interviewee No.5)."

> "Directness has the least impact on educational systems; thus, children's interests should be piqued through indirect techniques." The child enjoys certain activities, such as playing and painting … thus, they must take on various roles to interact with nature through their hobbies (Interviewee No.7)."

**The principle of observation and imitation in the child.** Imitation and observation are examples of intuitive learning in youngsters, in addition to their pro-nature features. Children imitate at various levels, and if other people's behavior is appropriate, this imitation and observation will result in proper behavior. Paying attention to the observational parts of children's environmental

**Table 3**
Environmental education strategies for 3-4-year-old children.

| Main categories | Sub-categories |
|---|---|
| Child empowerment | The child's direct connection with nature and its elements |
| | Roles assignment |
| | The principle of observation and imitation in the child |
| | Paying attention to the nature-friendly essence of the child |
| Indirect education of the child | Peer and significant other learning |
| | Parent education |
| | Use of interested educators and trainers |
| Production of relevant content and reviewing existing content | Generate content and present it through the media |
| | Preparation of comprehensive training programs |
| | Reviewing conventional teachings |
| | Using successful international experiences |
| Environment-oriented socialization | Institutionalizing interest in the environment |
| | Spreading and expanding the culture of respect for the environment |
| Creating appropriate infrastructure | Establishment of environmental education centers |
| | Harmonization of habitat with nature |

learning can significantly impact children's future environmental actions.

> "Children imitate what adults do. For example, her mother cooks; she sets up a kitchen using stones and clods and cooks. In modern society, his mother is a teacher. This child plays a teacher and imitates adults (Interviewee No.1)."

> The facilitator may not make a mess on the floor. We, as trainers, should not directly tell the children not to throw trash on the ground or that waste should not be discarded. We should not follow what the classical school teaches in this regard and what the media bombards children from morning until night. On the other hand, when the facilitator never throws garbage on the floor, and the child notices this and sees the facilitator as a caring adult who is always by his or her side and never imposes anything on them, the child notices this and imitates (Interviewee No.11)."

> "The behavior that the child witnesses has much more impact on him than if I open a book and read to my child about how nature is like this and how trees produce oxygen; he comes to understand my anti-nature morality when I drive from home to the end of the alley to buy only two loaves of bread, no matter how much I tell him." As a result, he has a mental conflict, which makes my behavior more effective (Interviewee No.7)."

**Paying attention to the innate pro-environment nature of children.** One of the most effective ways to teach children about the environment is to pay attention to their pro-environmental nature. Because of this, motivating children and removing dust from their innate nature is a terrific way to inspire them to care for nature. Children can be educated to conserve the environment by directing them to their inherent interests and engaging them with nature from birth.

> "The child's interaction with the environment is essentially optimistic, which means that the children enjoy the environment and its surroundings, including plants and birds. The child has intrinsic tendencies to love nature; nevertheless, it is the educator's role to assist the child in removing the dust from his nature so that it can adequately express itself and not turn to negative things (Interviewee No.2)."

> "Let the child love nature and then teach him at an older age when love takes over. Thus, the human child has an innate tendency toward nature, which means all his/her learning takes place through playing with the natural elements and other children and does not require an overt or covert curriculum (Interviewee No.9)."

## 5. Indirect education of the children

The second category from the analysis of interviews refers to indirect training. The directly educating of children under four years of age is undesirable, but indirect education can be an excellent way to turn children into pro-environment who adopt healthy behaviors.

**Peer learning and significant other.** Learning behaviors from peers and significant others a child is one of the indirect methods through which he/she learns. In addition to the parents and others around him, the child's learning, observation, and imitation may come from friends and people who are significant role models for him. The presence of influential friends and people in children's play groups and forming multi-person groups of friends can effectively induce appropriate behaviors and protect the environment.

> "We should look for the groups that influence other children most. Some youngsters, in general, are the leaders. We can guide the other children if we discover the leaders and influential people in kindergartens and have them become group leaders. Those who, for example, tell kids not to throw waste away in kindergartens are also accepted by the children (Interviewee No.6). "

> "To children, some individuals and figures are essential, and they enjoy acting like them. It is more beneficial to identify these people and their characteristics and teach good behavior to youngsters through them. (Interviewee No.10)".

**Parent education.** Another practical approach to indirect education is to train parents to influence and educate their children. Increasing the knowledge and literacy of parents about the environment and changing their behaviors to preserve it and take children to nature and public spaces are among the measures that make children interested in the environment. In this process, parents' views and attitudes toward nature and the conditions that make children love their surroundings must change. In addition, parents must learn the benefits of a child's development in nature.

> "The task of parents is that if they reach this level of certainty that the environment is important, they should change their behavior so that their children learn from them in this regard" (Interviewee No.4). "

> The parents must be trained to act as a team with this child. If you teach the mother, the child will learn automatically. However, if you educate a child, you must also educate his mother and father (Interviewee No.6). "

> "Children between the ages of three and four are usually in the care of their parents, which implies that our young children's education is mostly in their hands. The family must be at the center of everything. Put it another way, we must educate and equip the family to serve as our mediators and transfer these concepts and educational material to the children (Interviewee No.1)."

**Use of interested coaches and trainers.** The employment of interested and trained educators who are familiar with the needs and characteristics of children and can teach, communicate, and connect with them is one of the sub-categories of the indirect education of children. As a result, kindergarten teachers should be taught and assessed based on their interest in environmental and children's education.

> "Educators need to be trained, understand the nature of children and the best ways to interact with them, and be the ultimate model of a devoted and responsible citizen (Interviewee No.3)."

> "The person who wants to teach must be so interested in this category, and this category is so important for her that she can see this importance and that love … (Interviewee No.13)".

> "Good-trained and interested educators can help by creating sensitivity in understanding and institutionalizing environmental issues (Interviewee No.9)."

## 6. Creating appropriate content and revising existing content

The next item in the debate on children's education is creating relevant content and reviewing existing educational programs that promote the environment for children and make them aware of its value. Fundamental actions must be taken in this area, and successful experiences worldwide must be utilized.

**Content production and its media presentation.** One method for producing high-quality programs is to use a variety of media. The importance of the environment, the use and attention paid to the role of virtual media and the Internet, the appearance on television of an environmental education consultant, and the use of artistic language in the form of films and animation for educational purposes are all essential in media use and content creation.

> "The media has an important role. What we provide pupils in class has nothing to do with the influence of a tenth of a telegram or WhatsApp message … If I were the head of an environmental organization, I would pay an ecological education expert to demonstrate a few environmentally friendly practices in all TV shows. This strategy will be effective if it becomes an environmental habit (Interviewee No.4)."

> " … Do not look at animations and cartoons for kids like Rango, Ice Age, or Bird Escape, which are purely for enjoyment. In the case of Rango, for example, there was a water shortage. When we watch this animation, it expresses just how much trouble and crisis a lack of water in a place would produce. Perhaps it is more than simply entertainment when we watch such animations and cartoons with our children. (Interviewee No.5) "

**Preparation of comprehensive educational programs.** Children must be given adequate programs to be prepared for comprehensive educational programs. The effective utilization of educational information within a structured procedure and framework can help communicate a message to students effectively. Through this method, it is possible to educate children about the environment and help preserve it in the future.

> "Quality education must have a framework, content, a method, and a teacher. It is in the educational process and learning cycle that knowledge is conveyed to the mind and conscience of the child. Let us eliminate the shortcomings. Until now, we did not have much content on environmental education (Interviewee No.7)."

> "Content production is one thing, and publishing it is quite another. First, we should think about content, and then we should think about publishing. I feel that if we generate the content presently being developed in kindergartens, such as films, research, and what is about to be released, by the trustee's demands, it will reach the target audience (Interviewee No.9)."

**Revision of conventional training.** One of the main strategies for preparing comprehensive training programs is to revise the methods and techniques of environmental education. In this regard, it is necessary to go beyond stereotyped and outdated environmental education methods and teachings and reconsider the character of traditional schools and the lifestyles they promote. What has

been employed thus far is insufficient and needs to be evaluated.

> "The way environmental education is conducted and whether current programs are responsive are fundamental questions, and programs must updated. The current education methods are ineffective, and we must revise them anyway (Interviewee No.4)".

> The main problem is that the child does not know anything about the environment and has only learned a few clichéd phrases, and with this information, evolves into adulthood. Specifically, he or she does not have the education we expect them to have to be an environmental citizen and an environmental aligned to live and run the city in the future (Interviewee No.5)".

**Utilization of successful international experiences.** Using compelling experiences and initiatives from other countries and communities is one of the most basic ways to educate children about the environment. Children are pretty similar all over the world since they are not yet immersed in specific forms of cultural values and customs. If an intervention is successful in one country and community, it will likely be beneficial in other countries with minor changes and cultural considerations.

> "There are many developed countries around the world where programs and policies are designed toward ensuring that children are concerned about the environment and they can transmit these concerns to society. Thus, children are at the center of the debate as the principal owners of the environment (Interviewee No.12). "

> "The successful experiences of other countries are the least costly and most effective way to educate the environment. Accordingly, working groups and researchers should be formed to find successful programs and adapt them for implementation in the community. (Interviewee No.5)".

## 7. Environment-oriented socialization

The fourth major category of interview analysis relates to the environment-centered socialization of children, during which they learn and institutionalize healthy environmental behaviors.

**Institutionalizing environmental interest.** In addition to instilling a sense of responsibility in the child, the youngster's interest in the environment should be encouraged. The education of a youngster should direct his or her attention to the environment positively. Consequently, healthy habits and behavior will be ingrained in them from their lives. By institutionalizing environmental importance in childhood, it is feasible to nurture a child's affection for nature and camaraderie with the environment through community-based environmental education. There must be conditions in which the environment and its relevance are institutionalized across society. This impacts children because they are members of society and are in the socialization process.

> Working on issues since childhood becomes institutionalized and a structure for the individual who can follow it and be responsible for it in maturity. To raise a child, a positive path must be followed, and this way must be institutionalized. Childhood is the closest period to human nature; thus, our efforts and the ground we must offer are more important. As a result, we must work hard to obtain that form within this span so that our future tasks will be much easier. "(Interviewee No. 2)"

> "Children, if properly educated, and accustomed to nature from childhood, are expected to have no environmental severe issues in adulthood (Interviewee No.7)".

**Promoting and expanding an environment-friendly culture.** Promoting an eco-friendly culture in children is critical for their socialization and development as environmentally conscious individuals. This strategy is complemented by promoting culture and ecological responsibility on television, marketing nature-friendliness, and raising public environmental awareness. Starting a movement to promote environmental culture, introducing children to nature, and gradually building an environmental culture are all issues that must be addressed.

> "I believe there should be a movement to see the promotion of environmental culture in the country. … There was a foreign TV series that showed two personalities, one a detective and the other a lawyer. The detective was a protagonist for whom many viewers felt empathy. Whenever he wanted to brush his teeth, he would fill a glass with water and brush his teeth. I noticed that many people were doing it because they liked him. Which one of our TV series shows a healthy lifestyle and environmental behavior that I can identify with and repeat? (Interviewee No.4)".

> Managing resources and implementing community-based environmental practices will solve many environmental issues. Why should someone who smuggles a tree be caught only by a ranger? Ordinary individuals can do the same. That is, they don't seem to mind if this tree is the earth's lung; if it isn't this tree, I won't be able to breathe. If he feels this way, he can become a forest ranger himself, and policies must be implemented to address this (Interviewee No.6). "

## 8. Creating appropriate infrastructures

The fifth area of environmental education strategies for children is establishing the necessary infrastructure for effective education. Other initiatives will not be successful or sustainable unless infrastructure for environmental education and resource conservation is established. A suitable infrastructure encourages environmental sensitivity.

**Establishment of environmental education centers.** Establishing facilities and places where environmental protection can be taught is one strategy for developing surroundings that support environmental protection. Creating a proper setting for children to

interact and learn with one another, building nature parks to connect children with the natural elements, and dedicating parks and urban areas to children are all milestones in developing these centers.

> "Our first step in the educational path in any subject is to provide the appropriate conditions and environment in which the child feels that respect for nature is necessary and valuable, and for this, the appropriate infrastructure must be provided (Interviewee No.2)."

> "Even though we have much green space in our cities, Tehran, being a vast metropolis, has the least. So, how many parks does Tehran have? What's more, how many of these parks are open to children? Not for children. This means the parks are similar to a plant display, in which the children must follow the marked lines without touching the plants, spraying grass, or scoring a flower (Interviewee No.3)."

**Harmonization of habitat with nature.** The best way to create environmental education centers is to harmonize the living environment with nature so that the child knows the genuine nature of the environment. This technique includes designing the surroundings and paying attention to the components of nature at home, employing natural symbols in the classroom, building infrastructure and sensitizing through the five senses, and bringing elements of nature to the apartment.

> "It is better for families to incorporate plants and natural elements into their living spaces. The act of conversing with flowers reflects a mood that is established in the surroundings … We need to bring nature into the house because not everyone has access to it (Interviewee No.11)."

> "The child is all in the house. There is not enough play space in the apartments, so we must bring nature back to the house in some places. That is, we take steps to make the child feel those natural elements in his or her living environment (Interviewee No.13)".

> "It's almost as if the apartment is a child's prison." Even though this prison cannot be changed much, if the child has, for example, an insect, if he has a few silkworms in his house, he can look at them, if there is an aquarium where the child can see the fish life, if there are four flower pots in this room, or if the child has a flying bird in their apartment, it makes the prison more tolerable (Interviewee No.4). "

## 9. Discussion

Throughout history, the environment has played a significant role in society's health and sustainable development. Using any tool to spread the culture of environmental protection can guarantee humanity's present and future. These tools and methods should be based on cultural, social, and demographic characteristics. Because environmental protection is a habit that should be learned from childhood, investing and researching in this area is an essential step toward protecting the environment. It also considers the future to deal with future issues and disasters. Due to a lack of research in practical education, the current inquiry tried to provide acceptable and practical solutions for environmental education to children through an in-depth study.

The study's findings show that indirect instruction is one of the best ways to teach children about the environment. As a result, parents, teachers, and significant others need special training. Learning behaviors from peers and significant others by the child is one of the indirect methods through which the child learns. The child's learning, observation, and imitation may be influenced by his friends and other individuals who are significant to him as role models, in addition to his parents and people in his immediate environment. At various levels, children imitate others, and if the behaviors they imitate and see are appropriate, they will imitate proper actions. Consistent with this finding, White and Stocklin (2008), in their study, indirectly pointed to the specificity of learning in children and the importance of environmental education in childhood [19]. In addition, Sayer (2020), in her study, mentioned the prominent role of teachers and educators in the effectiveness of environmental programs [32].

The key to encouraging a child to respect the environment is to give them a role. Children feel responsible through role-playing and identify themselves with their roles. Assigning a direct role to children and involving them in environmental protection projects will strengthen their responsibility towards the environment. In addition, when children are directly involved in environmental protection through received roles, programs, and policies related to a sustainable environment will be more effective than before. Children can play a valuable and permanent role in sustainable development if their participation is taken seriously [16]. Children should be involved in defining problems and acting as reflective, critical participants in issues affecting their communities. They should participate in planning, design, monitoring, and management of the physical environment. Shobiri et al. (2013) concluded, in a study aiming to examine environmental attitudes and learning styles in preschool children, that the children proposed to learn about the environment through play, role-playing, and story-telling [33].

Learning based on experience in nature is another element of efficient education for children aimed at empowering them. According to the study, we should expose kids to more direct contact with nature and its components to interact with them directly and more effectively. This result is in line with Lashkari's (2016) findings. As he points out in his study, experiencing nature in childhood is being neglected in current education [34]. In a study on environmental education, Negev et al. (2008) concluded that special attention should be paid to children's cognitive, emotional, and psychological needs [35]. Consistent with this result, in the present study, attention to the innate nature-friendliness of the child was one of the extracted categories. Children have an innate desire to interact with nature and its elements. Even though this connection is sometimes regarded as harmful to nature, it is vital to the future preservation of the environment.

The data analysis showed that creating pertinent information and properly delivering it is a successful strategy for environmental education. The creation and dissemination of content through the media, with all its drawbacks and benefits, might be helpful in the modern world, given the media's hegemony. Other studies have also emphasized the media's critical role [36]. In their study, Khalili et al. (2021) emphasized that the mass media is a means of transmitting culture that, in today's society, sometimes plays a role more significant than the family and covers all cultural areas of human life [5]. According to Carlson et al. (2008), the media is a gateway for transmitting culture and is a vehicle for communicating cultural meanings. The study's results also included a review of traditional methods and their updating [37]. In this regard, Edward et al. (2016) highlight the shortcomings and difficulties of designing and implementing children's curricula and their teaching techniques and the need to modify the currently used methods [38].

According to the study's results, one of the basic strategies of environmental education for children was to use experiences from other communities. The successful experience of some countries in environmental protection and natural resource preservation can be helpful to other countries. The state of the world's environment and education at various levels reflects that in recent decades, However, the environment has suffered irreparable damage, movements and associations have been formed to reduce the burden of these problems. In most cases, governments have also been able to formulate and implement various environmental laws and regulations in all dimensions. These programs also place a high priority on early childhood education.

Environmental socialization and appropriate infrastructure construction were among the intriguing and creative aspects of the current investigation. Therefore, fostering an eco-friendly society is crucial for environmental socialization and raising future environmentalists. Consequently, since children must be raised with an interest in the environment to protect it in the future, this interest should be taken into account from an early age. Furthermore, it includes measures such as promoting eco-friendly behaviors on television and other mass media, nature-friendly socialization activities, and educating children about respecting and preserving the environment. In addition, other practical and effective solutions, such as creating centers where environmental protection can be taught and harmonizing children's living conditions with nature, should be considered.

## 10. Strengths and limitations

Considering the importance of environmental education in sustainable social welfare and the necessity of appropriate education to face and interact with the environment for future generations, a current study of the first research studies is presented to investigate the topic of environmental education for children and the strategies for improving this condition. However, the current study also has some limitations. It focuses on a topic that lacks sufficient data and information. Additionally, the results are based on expert interviews, but children and parents were not involved in the research. Another limitation is that the research was conducted only in Iran, which may result in different outcomes compared to other countries. Therefore, it is not possible to generalize the results to other countries. Furthermore, since generalization was not a focus on qualitative research, it is suggested to conduct similar research in other countries. Another limitation includes participation by residents in various parts of Iran. This was done to reduce costs and to meet the requests of residents for phone interviews.

## 11. Conclusion

The environment is crucial for the health and development of society throughout history. Utilizing any available resources to promote cultural preservation and environmental protection can ensure a sustainable future for humanity. All members of society need to engage in behaviors that support environmental education in all stages of life, especially during early childhood. The purpose of current research is to develop more effective and impactful educational strategies that foster a culture of environmental stewardship among children today. The results showed that child empowerment, indirect education of the child, production of relevant content and reviewing existing content, environment-oriented socialization, and creating appropriate infrastructure are vital strategies for effective environmental education for children. It is necessary to revise policies, interventions, and educational programs. For education to be effective for children, it is better to provide suitable conditions in both the individual and structural dimensions, and the education should be done indirectly. Additionally, promoting a positive attitude towards the environment through the design and implementation of community programs can be beneficial. Practical actions in this field include organizing hands-on environmental education activities such as gardening and plant cultivation, encouraging parents to participate in environmentally-focused educational programs for children, supporting teacher training in environmental education, utilizing networks and partnerships for the production of educational materials related to the environment for parents and children, and placing greater emphasis on lesson plans and the importance of the environment in educational content.

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## Ethical approval

The study was provided ethical approval by the University of Social Welfare and Rehabilitation Sciences (IR.USWR.REC.1399.270). Informed written consent was obtained both for participation in the study and for audio recording. In addition, the researchers obtained written consent from the spouses of the participants who were under 18 years of age.

## Informed consent

All participants were informed regarding the aim and objectives of the study, and verbal informed consent was obtained from all of the participants before participation.

## Data availability statement

Authors agree to make data and materials supporting the results or analyses presented in this paper available upon request. The data that support the findings of this study are available from the corresponding author, [Sina Ahmadi], upon reasonable request.

## CRediT authorship contribution statement

**Najmousaddat Mousavi:** Data curation, Conceptualization. **Sina Ahmadi:** Methodology, Investigation. **Maryam Sharifian Sani:** Funding acquisition, Formal analysis. **Seyed Fahim Irandoost:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Mohammad Ali Mohammadi Gharehghani:** Writing – review & editing, Writing – original draft, Software, Methodology. **Zahra Abdolhai:** Software, Project administration, Methodology, Data curation.

## Declaration of competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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