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The views of preschool educators on the development of environmental awareness through distance education

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ABSTRACT

This study explores the efficacy of distance education in fostering environmental awareness among preschool-aged students through the implementation of an educational game. The research investigates preschool educators' perceptions and attitudes towards distance education, the potential for developing environmental consciousness through this medium, and the impact of a specifically designed teaching tool on students' environmental awareness. Employing semi-structured interviews with nine Greek kindergarten teachers, the study examines the educators' experiences following the implementation of the educational game via video-conferencing over a three-week period. Results indicate a generally positive reception among educators toward distance learning, noting its potential for cultivating environmental awareness from a young age. Despite challenges such as parental connectivity issues and internet disruptions, both educators and students adapted seamlessly to the remote learning environment. Educators observed active student engagement and heightened environmental awareness post-game implementation, suggesting the effectiveness of distance education coupled with interactive educational tools in facilitating environmental education.

Keywords: distance education, e-learning, environmental awareness, preschool education, educational games

INTRODUCTION

The increase in environmental impacts caused by humans has raised significant concern among scientists (Nagra, 2010; Shende et al., 2015). To mitigate environmental issues, fostering a proactive attitude toward the environment is imperative for modern citizens. Developing environmental awareness, promoting responsible consumption habits, and embracing eco-friendly and recyclable products are crucial steps in addressing environmental challenges (Ari & Yilmaz, 2017; Panizzut et al., 2021). Environmental education plays a pivotal role in cultivating this mindset. Implementing comprehensive environmental education programs, starting from early childhood and including preschool, is essential for nurturing environmentally conscious individuals (Anbalagan & Rupali, 2015; Flogaitis et al., 2005; Papanikolaou et al., 2021).

The early years are recognized as a critical period for laying the foundation of environmental awareness, aiming to sensitize children and cultivate a positive and environmentally friendly attitude (Gontas et al., 2020; Russo, 2001; Tsekos et al., 2012). Guven and Yilmaz (2017) highlight the significance of the preschool age, as children undergo crucial developmental milestones encompassing motor skills, cognitive abilities, social-emotional development, and language skills. Research suggests that exposure to quality environmental education during early childhood can contribute to enhanced environmental consciousness across their lifespan (Campbell et al., 2002).

Theoretical Framework

One of the most significant global challenges is environmental pollution. Addressing this issue requires changes in people's behavior and attitudes (Finch et al., 2016). Problems arise from the ongoing conflicts between humans and nature, primarily due to insufficient environmental education during people's school years (Gontas et al., 2021; Konur & Akyol, 2017). According to the work of Yuce and Onel, (2018), developing ecological awareness in individuals requires ongoing education. It is essential to improve how we interact with the environment to create a sensitive society. This can be achieved through environmental education for students, ensuring a healthier environment in the coming years (Konur & Akyol, 2017). Education should provide the necessary knowledge and take care of the development of critical thinking of future citizens (Gavrilas et al., 2022).

Therefore, it is vital to implement environmental education not only from the early years of students' schooling but also throughout their school years to sensitize them to and instill respect for the environment (Tsekos et al., 2012). Research by Lubomira (2004) and Palmer (1995) has shown that environmental education helps early-age students develop a positive attitude toward the environment. According to Yuce and Onel (2018), individuals who have gained environmental awareness from a young age tend to care for, protect, and maintain a friendly disposition towards the environment.

For the effective education of students in the development of environmental awareness, educators play a significant role (Gavrilas & Kotsis, 2023a; Tuncer et al., 2009). Educators should possess the appropriate knowledge and a friendly attitude toward the environment to teach and sensitize their students (Gontas et al., 2020; Oncu & Unluer, 2015; Papanikolaou et al., 2023). Educators can enhance students' environmental awareness only when they have fundamental ecological knowledge and the right experience to achieve specific educational objectives (Desjean-Perrotta et al., 2008; Kotsis, 2023; Vlachos et al., 2024). Moreover, educators must teach environmental topics from the early years of students' lives. In doing so, even from preschool age, educators can ensure the development of environmental awareness in students to acquire a positive attitude and behavior toward the environment (Lubomira, 2004).

A school with the educational goal of promoting and enhancing students' environmental awareness fosters a relationship between students and the natural world (Hadzigeorgiou & Skoumios, 2013). According to Konur and Akyol (2017), the promotion of environmental education can commence within the student's family and further develop within the school community during preschool years. Children become sensitized through action, play, and active engagement with their environment (Jeronen et al., 2009). In addition to experiential activities conducted in the school environment, students can be sensitized through distance education. Distance education is a novel teaching method applicable both inside and outside the classroom, where the educator's role becomes more advisory. Distance learning has garnered significant interest among educators and students alike (Lai & Hwang, 2014).

The utilization of distance education holds the potential to bring about differentiation and significant changes to the educational landscape (Vrasidas & Glass, 2002). Distance learning can enrich the learning process and cultivate students' skills (Henderson & Yeow, 2012; Papadakis, 2016), serving as a versatile tool for educators and students to access diverse educational programs and activities (Haleem et al., 2022).

Through distance education, educators can tailor teaching methods and materials to suit the individual needs of each student, thereby enhancing teaching efforts to address their weaknesses. Students, in turn, can gain additional knowledge as they engage with educational programs utilizing information and communication technology (ICT), making distance education a crucial tool for knowledge transmission and information exchange (Anbalagan & Rupali, 2015; Burns, 2023). Additionally, it's important to recognize that informal learning experiences outside the classroom environment can benefit students of all ages, including preschool-age children (Kalogiannakis & Papadakis, 2017).

Through electronic learning, students can comprehend and become aware of environmental issues (Anbalagan & Rupali, 2015; Kalogiannakis & Papadakis, 2017). Preschool-age students can participate in an environmental program that enhances environmental awareness through distance education (Anbalagan & Rupali, 2015). Distance learning can serve as a means of teaching and promoting environmental issues (Caetano et al., 2018). Research has shown that electronic learning plays a significant role in environmental education, as preschool-age students become sensitized and improve their cognitive development, creativity, and autonomy (Ardoin & Bowers, 2020). Interactive games enable students to understand environmental problems (Pereira et al., 2020). Furthermore, electronic learning with interactive games is more effective and engaging (Panyajamorn et al., 2018). When implementing electronic learning during the preschool age, it is essential to select interesting and enjoyable activities that capture students' interest. In the context of environmental education, educators play a vital role in designing activities that allow students to have an active role (Konur & Akyol, 2017).

Improving education, particularly with a focus on integrating technology into the educational process, is essential (Graham et al., 2009). Educators should actively utilize technology within the classroom (Gavrilas et al., 2024a). However, some educators are not familiar with the use of new technologies and struggle to integrate them properly into their teaching methods (Gavrilas et al., 2020). To address this issue, the development of technological pedagogical content knowledge framework was significant (Mishra & Koehler, 2006).

Environmental education in preschool age can greatly benefit from educational games, serving as a powerful tool for educators (Siko & Barbour, 2012). These games enhance problem-solving skills and foster creativity in preschool children (Siko & Barbour, 2012). They also provide experiences that traditional teaching methods may not achieve (Kebritchi & Hirumi, 2008), especially when addressing environmental issues that a student may not have direct access to or experiences with.

Research by Betrus and Botturi (2010) indicates that games developed using Microsoft Office PowerPoint software can significantly increase student motivation, provide valuable feedback, and promote self-regulation and self-improvement. Additionally, these games can seamlessly integrate into preschool education, even as a component of distance learning, leveraging the accessibility and user-friendly interface of PowerPoint. This contributes to user-friendly interaction for both students and educators, some of whom, as mentioned earlier, may exhibit resistance to new technologies. They can easily create their own games with basic computer literacy skills or adapt them according to educational objectives and student needs. In this particular study, the games created with PowerPoint, as we will discuss later, are related to environmental issues.

Research Questions

Teachers, serving as facilitators of learning, hold a pivotal position in transforming knowledge into compelling and comprehensible lessons (Kotsis et al., 2023; Slavit et al., 2016). Through documenting their perspectives, educational institutions can acquire invaluable understanding of the obstacles and achievements in integrating technology, thereby enabling refinement of curricula and teaching methodologies (Gavrilas & Kotsis, 2024; Margot & Kettler, 2019). This study aimed to investigate perceptions and attitudes of preschool educators following implementation of a teaching tool through distance education to raise awareness and develop environmental consciousness in students aged four to six years. The research questions of the study are, as follows:

1. What are educators' views regarding the application of distance education in the preschool age?
2. Is it possible to develop environmental consciousness through distance education in preschool-age students?
3. Did the implementation of the teaching tool (game) enhance the development of environmental awareness in preschool-age students?

METHODOLOGY

Teaching Proposal

The researchers of this study developed a teaching tool (game) aimed at raising awareness among preschool-age students about environmental issues through distance education, in accordance with Prensky's (2001, 2003) model. Prensky's (2001, 2003) model, which delineates the requisite levels of learning a game must facilitate for players to attain predefined objectives, served as a guiding framework throughout the design phase. To create the teaching tool, images were obtained from the internet and appropriately modified and processed to meet the needs of the game. The game was constructed using PowerPoint 2007 software, adhering to principles governing games (digital or non-digital), including their structure and organization (objectives, purpose, rules, difficulty, challenge, imagination, constraints, instructions, choices, safety) (Alessi & Trollip, 2001). The educational game was presented to three educators prior to the conduct of the research, who suggested modifications, where necessary. Subsequently, was provided to the educators participating in the research, who also had the option to modify it if necessary, in accordance with the educational needs of their students.

Figure 1. Students choose where to play (Source: Authors' own elaboration)

Brief Description of Educational Game

The following provides a brief description of the educational game designed for preschool-age students, aiming to introduce them to environmental issues in a playful manner. Specifically, the game aims to teach concepts related to marine pollution, soil pollution, deforestation, the extinction of animals, and the concept of recycling. The game offers three choices to the students (**Figure 1**): they can choose to play at the sea (**Figure 2**), in the city (**Figure 3**), or the forest (**Figure 4**). Within each option, students engage in problem-solving activities, select correct answers independently, or collaborate with their peers.

Application of Teaching Tool

The teaching tool was implemented remotely through the Zoom video-conferencing application. The duration of each lesson was 40 minutes, spanning three weeks. Due to the students' young age and varying familiarity with using a computer mouse, the preschool teacher exclusively handled the game's controls. She engaged with the students according to the game's progression, prompting them to respond by collaborating to solve the presented problems. The objectives of the teaching tool are for students to

- acquire environmental awareness and a friendly attitude towards the environment,
- raise their awareness of environmental issues and learn about recycling,
- understand concepts related to pollution and environmental destruction,

Figure 2. 1st option: *The Sea* (students learn about sea pollution) (Source: Authors' own elaboration)

Figure 3. 2nd option: *The City* (students learn about soil pollution & recycling) (Source: Authors' own elaboration)

Figure 4. 3rd option: *The Forest* (students learn about deforestation & extinction of animals) (Source: Authors' own elaboration)

Table 1. Demographic characteristics of participants

Variable	Category	Frequency
Specialty	Preschool education	9
Gender	Female	9
	Male	0
Age	27-30	5
	31-34	4
Work experience	4-5	4
	6-8	5
Master's degree	Yes	8
	No	1

- develop critical thinking skills, justify their thoughts, and find ways to address problems, and
- interact and collaborate with their peers.

Research Method & Sample Selection

The research technique chosen for data collection was semi-structured interviews, incorporating open-ended questions. The study sample was opportunistic and comprised nine preschool educators from five different urban kindergartens in Greece (**Table 1**).

Data Collection & Processing

The interviews were conducted with nine Greek preschool teachers, from five kindergarten schools, approximately one week after implementing the educational tool with the students. The interviews took place at the interviewee's place of choice. The interviews were initially recorded and subsequently transcribed to obtain the research data. Data analysis was performed using qualitative data processing software, Nvivo 11.

Content analysis, as outlined in **Table 2**, was conducted to address the research questions of the study. It's important to note that the interviews and interview transcripts were conducted in the Greek language. However, for the presentation of the results in this study, they have been translated into English for the convenience of the readers.

Table 2. Categories of analysis

No	Category
1.	**Teacher information**
1.1.	Gender
1.2.	Age
1.3.	Studies
1.4.	Postgraduate studies
1.5.	Work experience
2.	**Distance education application**
2.1.	Application
2.2.	Teaching
2.3.	Positives & negatives
2.4.	Student reaction (positive or negative attitude)
3.	**Difficulties in implementing distance education**
3.1.	What challenges did teachers encounter?
3.2.	Activities carried out
4.	**Importance of developing environmental awareness**
4.1.	Importance of developing environmental awareness
4.2.	Potential for development from youngest ages
4.3.	Development by distance learning
4.4.	Contribution of ICT in development of environmental awareness
5.	**Teaching tool application**
5.1.	If students liked it
5.2.	If it was understandable for the students
5.3.	If it piqued the students' interest
5.4.	If students were concerned about environmental issues
5.5.	If there was interaction between the students
5.6.	Did students understand concepts related to environmental protection
5.7.	Help students become environmentally conscious
5.8.	Ways of evaluating students
5.9.	Students were asked to replay the game or another similar one
5.10.	It took hardware to run the game
5.11.	Change or improve the game
5.12.	Educational interest in game creation

Figure 5. Graph analysis-1 "word frequency tag cloud" (Source: Authors' own elaboration)

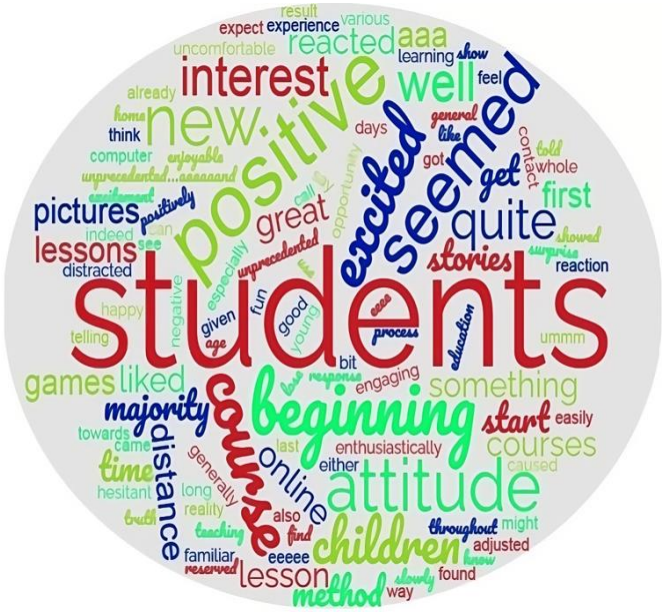

Figure 6. Graph analysis-2 "word frequency tag cloud" (Source: Authors' own elaboration)

RESULTS OF ANALYSIS

Implementation of Distance Learning

The educators appeared to hold a positive attitude toward distance learning, except for one kindergarten teacher who expressed a less favorable view towards this type of education. Educators mentioned that it was their first time teaching remotely. In **Figure 5**, the frequency of words from the interview data analysis is observed. The words 'children, experience, new, and teaching' exhibit the highest frequency and play a significant role in assessing the results.

> **I4**: '... a unique experience ... a new teaching method ... provides many opportunities in your teaching ... we maintained contact with the children.'

> **I7**: '... no, I have not taught remotely in the past. It was the first time this year.'

The educators stated that there are both positive and negative aspects to implementing distance learning. It was observed that, based on the educators' responses, the positive aspects outweigh the negative ones. One of the positives mentioned was that distance learning provides students with a new teaching method, while almost all educators cited the limited class time as a negative aspect.

> **I3**: '... it finds resonance among various groups of learners ... it can provide opportunities for education to individuals living in isolated areas or facing mobility or health issues.'

> **I7**: '... you offer new tools, new ideas, new learning ... you can capture students' interest through audiovisual materials, using videos, stories, and images ...'

> **I2**: '... there was no direct contact with the students...children had difficulty concentrating.'

> **I4**: '... the class time was limited ... you could not engage in many activities with the children ...'

As for students' attitude towards this type of teaching, all educators reported that most students had a positive attitude, with only a few appearing to be negative. In **Figure 6**, the frequency of words from interview data analysis is observed. The words 'students, positive, and attitude' exhibit the highest frequency and play a significant role in assessing the results.

> **I2**: 'Positive attitude. The students were quite enthusiastic ...'

> **I3**: 'Most students reacted enthusiastically ... only a few were initially negative.'

Challenges in Implementation of Distance Learning

The majority of educators appeared to face some difficulties during the lessons. More specifically, many educators mentioned the lack of consistency in parents connecting on time, and also internet disruptions as factors that made teaching challenging. In the following **Figure 7**, the frequency of words from the interview data analysis is observed. The words 'difficulties, connections, sometimes, and time,' and 'parents' exhibit the highest frequency and play a significant role in assessing the results.

> **I2**: '... regarding network connectivity, there were several interruptions.'

> **I5**: '... the lack of consistency in the timing of lessons on the part of parents and students, resulting in the loss of educational time ... some days, the signal happened to be weak ...'

Conversely, when it comes to the activities implemented by the educators, it appeared that neither the educators themselves nor the students faced difficulties adjusting the activities based on their needs.

Figure 7. Graph analysis-3 "word frequency tag cloud" (Source: Authors' own elaboration)

Figure 8. Graph analysis-4 "word frequency tag cloud" (Source: Authors' own elaboration)

> **I3**: '... I tried to create activities that met the children's requirements.'

> **I9**: '... no, it did not pose a challenge for us because I tried to adapt our activities to make it easier for my students and myself and to make the lesson more enjoyable.'

Importance of Environmental Awareness

The educators consider the development of environmental awareness in preschool-aged students to be quite significant. In **Figure 8**, the frequency of words from the interview data analysis is observed. The words 'important, learn, and age,' and 'young' exhibit the highest frequency and play a significant role in assessing the results.

Figure 9. Graph analysis-5 "word frequency tag cloud" (Source: Authors' own elaboration)

> **I3**: '... children need to be sensitized to the environment from a young age ... from preschool age, children can develop environmental ethics and learn to respect the environment in which they live.'

According to educators, the development of environmental awareness can also occur at a young age. The majority of educators stated that students can become sensitized to environmental issues through both distance education and experiential activities.

In **Figure 9**, the frequency of words from the interview data analysis is observed. The words 'can, distance, and children,' and 'experiential' exhibit the highest frequency and play a significant role in assessing the results.

> **I5**: '... it can be cultivated in younger children ... I consider engaging children in environmental issues from a young age important because it is the appropriate age for shaping social values, behavioral standards, and overall life attitudes ...'

> **I8**: '... it can be developed at both ages ... we can achieve this through distance and in-person lessons ...'

Educators largely agree that new technologies and games can contribute to the development of environmental awareness. According to educators, through new technologies, they have access to various online stories, songs, and games that can capture students' interest and help them playfully understand environmental concepts.

In **Figure 10**, the frequency of words from the interview data analysis is observed. The words 'children, can, and games,' and 'new' exhibit the highest frequency and play a significant role in assessing the results.

Figure 10. Graph analysis-6 "word frequency tag cloud" (Source: Authors' own elaboration)

Figure 11. Graph analysis-7 "word frequency tag cloud" (Source: Authors' own elaboration)

> **I5**: '... I consider the use of the computer and a gamified approach to learning necessary ... especially for subjects like environmental topics, which are considered challenging for younger children ... after all, images, educational videos, and interactive games are tools that greatly help in maintaining the interest and attention of younger children ...'

Application of Educational Tool

Educators' opinions regarding the educational tool they applied remotely were quite positive. According to the educators, they liked the game very much, considering it had nice images and colors, making it quite appealing to the students. All educators stated that it was comprehensible and engaging for the students. In **Figure 11**, the frequency of words from the interview data analysis is observed. The words 'nice and game,' and 'liked children' exhibited the highest frequency and played a significant role in assessing the results.

> **I1**: '... I liked it very much ... nice images for children ... with nice examples and messages that children can understand through these images ... I found it very interesting for the children ...'
>
> **I4**: '... I found it very interesting, quite appealing to the children ... I liked the images used; they were attractive to the children, and their structure was very well organized. It was a game that was special to me ...'
>
> **I4**: '... it was quite comprehensible for my students ... its content was suitable for the children's age ...'
>
> **I7**: '... it captured their interest so much ...'
>
> **I9**: '... my students were thrilled ... they showed that it drew their attention, and they actively participated ...'

The entirety of the educators stated that the game was quite easy to implement, causing no difficulties for either themselves or the students. Moreover, the educators reported that the students contemplated environmental issues during and after the game.

> **I1**: 'No, it was quite easy, neither I nor the children faced any issues ...'
>
> **I4**: '... especially during the game ... the students showed intense contemplation ... upon completing the game, my students expressed numerous questions that, from what I understand, were provoked by this game ...'

With the application of the teaching tool, the educators reported that the students interacted throughout the game to solve the problems that arose. There was interaction through discussions with both the educator and their fellow students.

Figure 12 illustrates the frequency of appearance of words from the interview data analysis. The words 'game, students,

Figure 12. Graph analysis-8 "word frequency tag cloud" (Source: Authors' own elaboration)

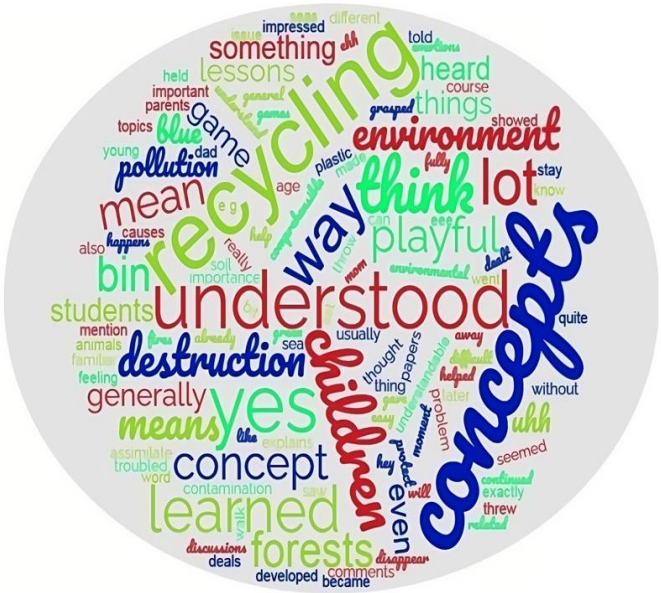

Figure 13. Graph analysis-9 "word frequency tag cloud" (Source: Authors' own elaboration)

Figure 14. Graph analysis-10 "word frequency tag cloud" (Source: Authors' own elaboration)

and interaction,' and 'solve' exhibit the highest frequency and play a significant role in assessing the results.

> **I4**: '... the students constantly interacted ... they communicated on how to solve the problems presented by the game ...'

> **I5**: '... students exchanged opinions, relevant experiences; there were several moments when one helped or complemented the other, sometimes they agreed, and other times they disagreed, each putting forth their arguments ...'

The educators stated that the students comprehended environmental concepts to a great extent. All educators responded that their students became more environmentally aware after using the game. The game helped students understand, in a playful manner, the impacts of human activities on the environment. The frequency of words from the interview analysis results is presented in **Figure 13**. The words 'understood,' 'concepts,' and 'recycling' have the highest frequency and play a significant role in evaluating the outcomes.

> **I4**: '... through a playful way, they comprehended concepts about the environment ... concepts that are easy and understandable for the children's age ...'

> **I9**: 'They learned the meaning of protecting a word that has great importance for the environment ...'

> **I4**: 'This game positively contributed to sensitizing students remotely and fostering environmental awareness ...'

Regarding the assessment of students' environmental awareness, most educators stated that they evaluated the students based on the discussions that took place during the lessons, as well as the discussions between students and parents. **Figure 14** displays the frequency of words from the interview analysis results. The words 'game,' 'environment,' 'think,' and 'students' have the highest frequency and play a significant role in evaluating the outcomes.

> **I5**: '... through their responses, the difference in students' thinking regarding the environment and their sensitization became evident ... parents informed me about the environmental concerns and contemplations expressed by the children at home, various ideas and solutions that the students came up with concerning environmental issues ...'

> **I4**: '... a student tells me, 'Miss, I want when schools open again, all of us to go to a forest and collect garbage and take care of the forest ...''

All educators stated that the students requested to play the game again, and some mentioned that the students asked to play other similar educational games. Some educators stated that parents wanted to have the game so that their children could play it again at another time outside of class. The educators did not seem to require any additional technical infrastructure since the PowerPoint program was already installed on their computers, which, in their opinion, makes it particularly user-friendly.

> **I6**: 'Yes, and we played it again. Parents asked me to send it to them so their children could play it at home on their own ...'

> **I4**: 'No ... PowerPoint was already installed on the computer, and in my opinion, it's quite user-friendly.'

Most educators said they would not make any changes or improvements to the game, while some mentioned that they would like to add other thematic units. Finally, the educators seemed to have a positive attitude towards creating a similar game for implementation in their classroom or remotely. One educator pointed out that they would not create a new game if it required knowledge of another program.

> **I4**: 'I think not … this game … for me, it was … I consider it suitable for the children's age, and the content was also easy and understandable … I would not make any changes.'
>
> **I6**: 'No, it was good … simply, other stories could be added…'
>
> **I6**: 'Yes, it's interesting … the main thing is that it's done in PowerPoint, which I generally know how to use, so maybe I'll think about doing something similar at some point. If I had to learn another program, I would not consider making something similar.'

DISCUSSION

In the discussion of our findings, it is evident that the majority of educators demonstrated a favorable attitude toward distance learning, a trend also documented in the research by Plotka and Guirguis (2023). In the study by Bubb and Jones (2020), some preschool educators reported a reduction in their workload, allowing them to dedicate more attention to students. Notably, for most educators, this marked their initial venture into remote teaching. We observed that distance learning has both positive and negative aspects, while limited class time stands out as a significant drawback. Szente (2020) similarly found that teachers were comfortable with the operation of teleconferencing programs in their classrooms or homes and were able to share screens, use digital books, and online links for activities.

Regarding students' attitudes towards this mode of instruction, all educators reported that the majority displayed a positive outlook, with only a few expressing negative sentiments. Many educators faced challenges during lessons, particularly inconsistencies in parents' timely connectivity and internet disruptions, which complicated the teaching process. Dong et al. (2020) also reported that implementing online learning during the pandemic was problematic and challenging for preschool students' families. Similar conclusions were reached by Hu et al. (2021), as they noted that implementing online learning for young students was problematic and challenging for families. However, concerning the activities implemented, both educators and students managed to adapt seamlessly to meet the students' needs.

Educators collectively stressed the importance of instilling environmental awareness in preschool-aged students (Lamanauskas, 2023). They emphasized that such awareness can be cultivated from a young age, with the majority indicating that students can develop sensitivity to environmental issues through distance education and experiential activities. Educators widely agreed that new technologies and educational games can play a pivotal role in enhancing environmental awareness (Kabadayi & Altinsoy, 2018). They highlighted that these technologies provide access to online stories, songs, and games that capture students' interest and facilitate their playful comprehension of environmental concepts (OECD, 2019a). Educators expressed predominantly positive opinions regarding the educational tools used remotely. They found the game visually appealing, with pleasing imagery and colors, and it was straightforward to implement, posing no significant challenges for either educators or students. Furthermore, students contemplated environmental issues during and after playing the game (Fjællingsdal & Klöckner, 2019). A positive aspect is that educators express willingness to utilize the new technology henceforth. Therefore, educational institutions responsible for training new educators, such as universities, should accordingly adapt their curricula, while educational bodies should provide high-quality training to in-service educators (Gavrilas et al., 2024b).

During the application of the teaching tool, educators observed active student interaction throughout the game, including discussions with educators and their peers. The educators noted that students displayed a significant understanding of environmental concepts, with all educators concurring that their students exhibited heightened environmental awareness after using the game, facilitating their understanding of the environmental impact of human activities in a playful manner. Regarding assessing students' environmental awareness, most educators relied on evaluations based on discussions during lessons and interactions between students and parents (National Research Council, 2001; OECD, 2009b). All students desired to replay the game, with some requesting similar educational games. A few educators noted parental interest in providing access to the game for their children to play outside regular class hours. While most educators did not intend to make changes or improvements to the game, some expressed interest in adding other thematic units. Ultimately, the educators displayed a positive attitude toward the prospect of creating similar educational games for use in their classrooms or remotely, something that has also been recorded in another research (Jääskä & Aaltonen, 2022; Korkmaz et al., 2023; Xiong et al., 2022).

CONCLUSIONS

Following the literature review, the significance of implementing an environmental education program in preschool education was established to achieve the goals of sustainable development and sustainability. The development of an educational tool aimed at raising awareness and fostering environmental consciousness among preschool students and its application through distance education presented a challenge. The combination of distance education with suitable educational games offers new educational prospects. Educators with the right knowledge can successfully apply them in preschool education, allowing students to benefit from these new opportunities. In addition, modern education should provide the necessary knowledge to students but also take care of the development of the critical thinking of future citizens so that they can make the most appropriate decisions for their lives (Albanese & Paturas, 2018; Gavrilas & Kotsis, 2023b; Liu et al., 2021; Marin & Halpern, 2011).

Limitations

The generalizability of research findings can be limited when the sample does not represent the population of interest. Future studies could aim to include a more diverse larger sample of participants from different regions and educational specialties and backgrounds to improve the generalizability of research findings.

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Declaration of interest: No conflict of interest is declared by the authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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