FEATURES OF CONTINUING ENVIRONMENTAL EDUCATION IN THE DIGITAL AGE

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Abstract. The development of the environmental crisis and digital transformation requires a revision of the structure and content of environmental education. This study studies the main features of continuous environmental education in the digital era, shows the implementation of the sustainable development goals of Kazakhstan. The study uses scientific papers, a comparative review of international digital training platforms (Coursera, EdX) and analysis of additional data from UNESCO (2023-2025) and OECD (2021-2025) reports. The results show that digital technologies significantly improve accessibility, personalization and interactivity in environmental education. At the same time, digital tools in virtual modeling systems, training in artificial intelligence have a high impact on the correct formation of environmental conceptual understanding. According to the research work, it comes to the conclusion that the use of digital technologies is very important for achieving the Sustainable Development Goals in the integration of continuing environmental education.

Keywords: environmental education, environmental literacy, digital technologies, sustainable development goals

Introduction. In the Address of President Kassym-Jomart Tokayev to the people of Kazakhstan dated September 8, 2025 [1], he outlined artificial intelligence and digital development as a strategic direction of public administration and put forward the main state initiatives in shaping the future of the country. This will ensure socio-economic stability, digital transformation and social modernization of the country.

However, global environmental crises such as climate change, the threat of biodiversity extinction, and declining natural resources require transformation in the educational paradigm. Currently, environmental education is the main driver of sustainable development (UNESCO, 2023),

environmental education is not seen as a subject or a variable course, but as an integral part of the trajectory of learning throughout a person's life.

The integration of digital technologies enables continuous (lifelong) learning and becomes relevant due to the interdisciplinary nature of environmental education. In the digital age, the content of education will now be performed not only by the audience, but also by online platforms, open courses, simulations, mobile applications and social networks.

Digital coverage in the country is at a high level: at the beginning of 2025, 19.2 million people (93.51%) used the Internet. Therefore, the use of digital educational resources can become an auxiliary tool for solving the problem at hand.

Digitalization of the preschool educational process involves increasing the efficiency and quality of all levels of the educational process with the implementation of the goals of developmental education, oriented personal education using digital educational resources. The use of digital technologies in preschool organizations, along with the cognitive, research, communication skills of the younger generation, has a great impact on the development of thinking on environmental topics.

An integrated approach to the development of the country's ecological culture is the Concept for the Development of Ecological Culture «Taza Kazakhstan» for 2024-2029. Implementation of various methods and approaches to the formation of ecological culture - ecological education, education and enlightenment, eco-communication, ecological self-education and self-education [2].

This concept, in turn, indicates the need for special attention to the creation of an environmental educational environment in a preschool organization, providing high-quality preschool education and training as a successful start in the life of an early child.

Literature review and methodology. In the education system today, the inclusion of digital works based on the phenomena of «digitalnative» should not be ignored. The relevance of the use of digital technologies in modern preschool education lies in the intensity of the information society, the widespread distribution of multimedia electronic information resources, the constant, even continuous use of the possibilities of the social network in education, communication and upbringing.

In this regard, digitalization is becoming an integral part of the learning process in preschool organizations. This is familiar and accessible and very convenient for educators of a preschool organization [3]. The reason is that the use of digital resources in mastering the educational material provided to the child, despite the virtuality, gives a clear and accurate thought. Smart devices educate a preschool child to independent work and develop intellectual activity.

A. Zhumagulova notes that digital technologies often have a positive and sometimes negative effect on the child's consciousness 4]. The need to implement the achievements of Artificial Intelligence (AI) on the topic of ecology by Rafik K. et al. showed that in optimizing interdisciplinary connections, new opportunities open up for the use of generative variants of ecology [5]. Reyhani Haghighi and others in their research stated that a large number of materials adapted to ChatBot services make it possible to simplify a number of works [6].

In the formation of students' personal abilities, M.K. Kursabaev et al., Considering ways to solve the Artificial Intelligence in Pedagogy or Education electronic digital ecosystem, studied that the student contributes to the development of cognitive and creative thinking by preparing interesting materials that reveal the content of the environmental topic [7]

We consider digital environmental education not only as pedagogical innovations, but also as a strategic tool for solving environmental problems.

Results. This study is aimed at identifying and analyzing the specific features of continuous environmental education in the digital era, assessing its effectiveness based on modern international experience. An analytical review of research work on the subject of research was carried out, conclusions on environmental topics were analyzed. Based on the achieved materials, general valuable opinions and scientific approaches were taken into account.

Methods were used to control the cognitive and creative activities of teachers of preschool organizations that are the object of research, in the course of mastering digital knowledge, comparative analysis of readiness for the transfer of environmental knowledge and education.

The following data has been achieved on the considered issue:

Question 1: How much do we use artificial intelligence platforms and digital resources in the environmental education process? [Table -1]

Table-1 Percentage description of query-response results

№	Question	Total Response Result (%)			
		Always	Sometimes	Rare	Abstained
1	How often do we use AI platforms and digital resources in the environmental education process?	38, 5	41, 8	19	0, 7

Question 2: Is the environmental educational environment (site) effectively organized in the group? [Table -2]

Table -2 Percentage description of query-response results

№	Question	Total Response Result (%)			
		Fully	Enough	Not enough	Abstained
1	Топта экологиялық білім беру ортасы (алаң) тиімді ұйымдастырылған ба?	23	61, 5	8, 9	6, 6

Discussion. As the results of the survey showed, 38.5%of respondents noted that in the process of environmental education they constantly use digital resources and AI platforms, and 41.8% sometimes. This means that overall, 80.3%of participants use digital tools to some extent. However, the high response rate «sometimes» (41.8%) shows that digital technologies are not fully and systemically integrated into the educational process. That is, often AI tools are used as an auxiliary or auxiliary tool and have not yet fully become an integral part of the main pedagogical strategy. At the same time, the rare use of digital resources 19% of respondents demonstrate the uneven digital competence of teachers or limited technical capabilities. Generally accepted results show that digital environmental education is still in its infancy and needs to be moved to the systemic level.

The results obtained on the second issue made it possible to assess the level of organization of the ecological educational environment. 23%of respondents rated the environment as fully organized, 61.5%noted that it is quite organized. In general, a positive assessment of 84.5% indicates that an environmental infrastructure has been formed in the education system.

This indicator shows that in Kazakhstan there are basic conditions for environmental education, in particular, curricula, resources and educational space are provided to a certain extent. However, the presence of a high rating «completely» only 23% indicates the need to further improve the quality of the ecological educational environment. That is, despite the fact that the current conditions are sufficient, it is necessary to raise them to a higher level by strengthening innovative and digital components. At the same time, the assessment of 8.9% of respondents «not enough» shows that in some educational organizations there are material and technical or methodological problems.

Conclusion. Teachers of future preschool organizations cannot stay away from the use of digital technologies in professional activities. Therefore, these needs for the training of teachers of future preschool organizations should be included in the content of this education.

Capabilities of artificial intelligence technologies in preschool organizations:

- availability of specialized centers for various sectors of development of advanced digital resources;
- Creation of new tools for the development of the environmental culture of children, allowing them to change them independently;
- apply new visualizations in accordance with the content of organized activities;
- availability of applications that allow you to quickly update information;
- the use of various multimedia information, animation stimulates the development of cognitive and creative thinking.

The results obtained in the digital transformation of continuing environmental education:

1. systematic implementation of AI and digital tools;
2. increasing the digital and environmental competence of teachers;
3. filling the educational environment with digital content;
4. Combining theoretical knowledge and practical environmental action.

Thus, continuous environmental education in the digital age should be considered as a strategic factor that ensures the implementation of the goals of sustainable development not only of the education system, but also of Kazakhstan.

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