Forms of Environmental Education in Conditions of Distance Learning

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Abstract: Environmental education in modern conditions of digitalization represents a continuous education using ICT tools. Universities, protected natural areas and their specialized institutions, as well as online platforms, can serve the bases for environmental education. This article is a review of information sources and literature, carried out with the goal of presenting the forms of distance learning in environmental fields that currently exist in the Russian Federation, and in particular, in Saratov Oblast. The authors described the experience of its implementation on the basis of universities and specially protected natural areas. Environmental education of the general population is considered an important tool for solving environmental problems. Conclusions are formulated about an importance of integrated ecological development for the formation of ecological culture in Russian society.

Keywords: environmental education, distance learning, information and communications technology (ICT), specially protected natural area (SPNA), municipal solid waste (MSW)

Introduction

Environmental education is a lifelong learning process targeting all categories of the population, according to the North American Association for Environmental Education [1]. In the Russian Federation, in accordance with the Federal Law of January 10, 2002, No. 7-FZ, *On Environmental Protection* (as amended on December 30, 2020), in order to form an ecological culture and professional training of specialists in the field of environmental protection, a system of universal and comprehensive environmental education is to be established, including secondary education, secondary vocational education, higher education, and advanced professional training of specialists, as well as the dissemination of environmental knowledge, including through the mass media, museums, libraries, cultural institutions, environmental institutions, sports organizations and tourism [2].

According to the *Fundamentals of State Policy in the Field of Environmental Development of the Russian Federation for the Period up to 2030*, the formation of environmental culture, improvement of environmental education and upbringing are the main tasks of the state policy in the field of environmental development [3]. In the context of an increasing technogenic pressure, the preservation of ecological and social sustainability is urgently needed. The environmentalization of

all spheres of society and the digitalization of education are topical issues for the world community. The value of searching for tools to use in environmental education is actualized in the realities of the need for the State to comply with the major challenges sensu the *Strategy of Scientific and Technological Development of the Russian Federation* (2016) [4].

At the beginning of 2020, the entire world faced the threat of a change in the conventional order in all spheres of society, caused by new COVID-19 coronavirus infection. In the context of the pandemic, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has recommended the use of online tools, such as collaboration platforms that support synchronized communication functions [5]. In emergency situations, the use of information and communications technology (ICT) tools allows carrying out the educational process continuously. The ability to access and manipulate information has contributed to the emergence of trends in environmental education and the development of modern forms of its functioning.

This publication is a review of information resources and literary sources. The object of research in our study was contemporary environmental education in Russia. The objective of our study was to review the forms of environmental education in the context of the need for social distancing. To achieve this goal, the tasks of describing environmental education with the participation of Russian universities via ICT use, distance environmental education in specially protected natural areas (SPNA), and digital environmental education as a tool for solving the problem of waste separate collection have been identified. Substantial attention in this article is paid to the experience of conducting the ICT-based events in Saratov Oblast.

Continuous Environmental Education With the Participation of Universities Using ICT

Seasonal field practices, traditional for natural sciences, were held online in 2020. The Summer School for Young Scientists, dedicated to a multidisciplinary approach and applied aspects of modern ecology and photobiotechnology, was held in August 2020 in a distance format on the basis of the research center of Pskov State University, with the support of the project No. 20-64-46018, *Development of a Distributed System of Environmental Monitoring of Water Bodies Using a Network of Automated Measuring Stations* (grant from the Russian Science Foundation for research with participation of prominent scientists) [6, 7]. Over 100 participants from 14 universities and 5 leading research institutions of Russia took part in the work of the school [8]. Online lectures and open discussions, master classes with demonstration of laboratory research and video clips were held [6].

In the fall of 2020, in the Volga region, applications were accepted for participation in the regional program '*ECOprom. Responsible Production and Consumption: Preserving Natural Resources for Future Generations*', with the subsequent quality review and awarding the winners in winter of 2020. Scientists, faculty, undergraduate and graduate students and postgraduates of Russian universities were eligible to participate [9]. The program was implemented in accordance with the 2020 regulations by the autonomous non-governmental organization, '*Scientific and Educational Organization of Energy and Ecology*', with the goal of preparing and distributing popular science materials in order to inform the public about nuclear industry development, environmental safety and resource conservation, as well as to identify experts in the field of state-managed system of handling hazardous and extremely hazardous waste, environmental protection, and safe development of advanced Russian technologies (including nuclear technologies and nuclear power generation) [9].

The regulation, among other things, described the conditions of the regional program, including the use of ICT: the publication of the final materials and presentations on the Internet pages of participating organizations and in social networks. The process of filling out the application by prospective participants was carried out remotely, using an online form [9].

Opportunities of the distance learning mode facilitated the participation of faculty and students of Yuri Gagarin State Technical University of Saratov (SSTU) in the IV National Roundtable Conference of University of Ioannina (UI), *Green Metric* and *Green Universities of Russia*, organized in September of 2020 by the Peoples' Friendship University of Russia (RUDN) under the auspices of the Green Metric partnership of universities [10]. Participation in a videoconference in English on the Zoom platform contributed to the development of a project for the

presentation of data by SSTU ecology professionals in the ranking of green universities of the world [10].

The *UI Green Metric World University Rankings* includes the UI, Greece [11], in environmental and educational events of which, the universities of the Volga region actively participate. The faculty, graduate and undergraduate students of the Laboratory of New Technologies and Distance Learning at UI annually organize international summer schools dedicated to the development of green technology and research methods [12]. According to the laboratory's website, summer school students take part in roundtable discussions and presentation sessions on ICT use in green projects [12]. Within the framework of the event venues, the issues of lifelong learning, use of role-playing interactive tools for environmental protection, green tourism and media are worked upon [12].

Due to partial or complete transformation of events into online format, the mode of conducting international and Russian national events has changed. In October of 2020, at SSTU, university students participated in the Russian national event, 'EcoTalk' [13]. According to the official news report on the event, 11 leading Russian universities have joined the campaign [13]. By means of computer technology, synchronous work was organized with participants from all over the country [13].

In October of 2020, SSTU hosted the II Russian National Scientific and Public Forum 'Environmental Foresight', in conjunction with the Federal State Unitary Enterprise 'Federal Environmental Operator' and the Federal Scientific and Educational Consortium 'Advanced Environmental Technology' with the support of relevant ministries of Saratov Oblast Government and Saratov Branch of the Institute of Ecology and Evolution Problems of the Russian Academy of Sciences [14].

Among the events of 'Environmental Foresight', there were Russian National Scientific and Practical Conference, Russian National Competition of Scientific Research Papers of Young Scientists, the Contest on Social Environmental Advertising, a panel session, and a roundtable discussion [15]. The forum was implemented in personal participation format at the SSTU *Boiling Point* venue, with remote involvement of participants from the regions of the Russian Federation [15]. The capabilities of the Leader-ID information platform and YouTube video hosting facilitated the live broadcasting of the event opening ceremony [15].

Boiling Point venue, created with the support of the Agency for Strategic Initiatives (ASI) within the framework of the Science and Technology Research Program since 2014, have played a significant role in the formation of environmental awareness in recent years [16]. The mission of SSTU in the context of this program is to popularize the digital transformation of the university as a *pivotal institution* in the region [16]. During the pandemic, the SSTU Boiling Point did not stop carrying out events aimed at transferring experience and results of scientific activities, and creating new development models.

In February of 2021, as part of celebrating the Day of Russian Science, the *ScieNTIst's Talk event* 'Scientists about the Future' was held at the SSTU Boiling Point. Environmentalists devoted their speech to the participation of the university in the implementation of the National Priority Projects [17]. Another large-scale Boiling Point network event in February was held in the context of implementing the Russian Federation Presidential Decree No. 812 of December 25, 2020, 'On the Year of Science and Technology in the Russian Federation' [18]. Scientists of the SSTU Department of Ecology, within the framework of the lecture, turned to the analysis of knowledge and competencies of a modern ecologist, novel forms and programs of personnel training, experience of project training, and environmental volunteering [18].

Distance Environmental Education in Protected Areas

In March of 2020, functioning of visitor centers and museums, and carrying out of field trips and exhibitions, along with leisure and other events, were temporarily suspended in the protected areas of the Russian Federation, in accordance with the Order of the Ministry of Natural Resources of Russia [19]. In response to the measures to stop the spread of new coronavirus infection, specialized organizations contributed to the transfer of environmental educational activities in a distance learning mode. Under the slogan, "Let Us Protect Nature from Home. Together!", the phenological network of the Russian Geographical Society (RGO), in collaboration with the Russian Textbook Corporation, had launched the *Nature Under Our Protection* competition in April

of 2020 [20]. Participants were asked to develop a digital route through protected areas or an online field trip project and attach photographic materials [20]. One of the nominations was the *Best Computer Project*, which involved the development of a website or an interactive map [20].

In the summer of 2020, the results of the competition, *Ambassadors of Specially Protected Natural Areas*, held as part of the annual festival "VuzEcoFest-2020" with the support of the Ministry of Natural Resources of Russia, were summed up [21]. According to the news report from the Press Center of the Russian Ministry of Natural Resources, the organizers received about 100 applications; the finalists were 15 participants from the cities of the Russian Federation, who recorded best video messages about nature reserves [21]. One of the finalists was the ambassador of the Khvalynsky National Park (NP) of Saratov Oblast [22].

Khvalynsky NP has the status of a protected area of federal significance. According to the official information resource of the NP, environmental education activities are conducted in several main areas: through the mass media (printed publications, radio and television appearances), lectures and discussions, contests and environmental quizzes, festivals and exhibitions, and field trips [23]. Environmental education of the population is promoted by such NP objects as nature trails, open-air zoo, modern interactive nature museums (*Ecosvet*, *Microworld*, *Museum of the Bee* and *Groundhog Museum*) [24].

On the basis of the NP, field practices for university students and summer schools for middle and high school students, along with scientific and practical conferences for children and youth [23, 25], are held annually. All of these are designed to promote education about the environment and local lore, and form the environmental awareness in younger generation. In conditions of necessity for the transformation of environmental educational events into the online mode, in 2020, the NP offered to the participants of the educational process the distance mode of participation in the VII International Scientific and Practical Conference, *Specially Protected Natural Areas: Past, Present, Future*, organized with the participation of the SSTU Department of Ecology [26].

Among other online events of the protected areas in Saratov Oblast, there is a large-scale Russian photo contest dedicated to the Red Data Book Schrenk's tulips (*Tulipa suaveolens*) and the regional protected area, *Kurilovskaya Steppe*. In the summer of 2020, the organizer of the environmental education competition in the Novouzensky District of Saratov Oblast was the Native Land Foundation with the support of the Presidential Grants Foundation. According to the official information resource of the Ministry of Natural Resources and Ecology of Saratov Oblast, 1,467 projects were mailed from over 30 Russian cities [27]. Photos of the contest winners were included in the published set of full-color environmental awareness postcards [27].

Digital Environmental Education as a Tool for Solving the Problem of Waste Separate Collection

At present, just 7% of waste is recycled in Russia, whereas in some European countries, the rate of municipal solid waste (MSW) utilization is about 60%, according to the analysis of the *Waste Reform* (2019) by the Accounts Chamber of the Russian Federation [28]. Nearly all MSW (90%) is deposited to landfills [28]. According to the analysis, on the territory of Saratov Oblast, the situation with landfills is among the worst in Russia, and their capacity is estimated to be exhausted by 2022 [28]. The Saratov region lags behind in assessing the measures for the MSW separate collection, as well as in investigating its composition; most importantly, it lags behind in the incentives in the field of MSW management, the use of the best available technologies and educational activities.

Key initiatives in the issue of informing the Russian Federation population about the problems of MSW management come from specialized institutions and volunteer organizations. The emphasis is on actions to dismantle existing landfills and clean up natural sites with the involvement of volunteers [29]. At the same time, abroad, informing target audiences is carried out by authorities and environmental companies, often via ICT; in particular, mobile applications, as pointed out by the experts of the Smyslografiya Analytical Agency [29].

Environmentalization and digitalization trends in education have played a role in the issue of waste separate collection. Projects for motivated residents emerge in Russia. For example, the project '+1City' (Useful City), implemented with the use of a Presidential Grant of the Russian Federation for

the development of civil society, provides users with an online map and city navigation through social and environmental services [30]. According to the official website of the project, 650 cities and towns in Russia have access to over 66 thousand services in 48 categories [30].

Another ICT tool useful for Russian environmental activists is the online *Recyclemap* from the Greenpeace. With the participation of volunteers, information about the existing points of collection of secondary raw materials in the cities of Russia and the world is put on an interactive map. According to the official website of the project, it contains up-to-date information about the collection points for waste paper, glass, plastic, clothing, energy-efficient light bulbs, and batteries, [31].

Partly digital Russian events include, for example, *Clean Games* (competitions on cleaning up natural areas from garbage and on waste separate collection [32]) and *Swap* (events on exchanging clothing pieces and household items [33]. In the city of Saratov, the *Green Bull* volunteer movement is engaged in thematic projects. The actions by this organization made it possible to collect 24 previously sorted fractions of secondary raw materials, thereby prepared for delivery to the proper facilities by the city residents according to instructions in social networks and recommendations of volunteers [34].

Conclusion

In our paper, we presented a review of literary sources and information resources in order to examine the forms of environmental education in current conditions of the need to maintain social distancing. The authors identified the tasks of describing environmental education with the use of ICT, on the basis of Russian universities, especially considering the experience of Yuri Gagarin State Technical University of Saratov, Russia; environment-related distance learning on the basis of protected areas in Saratov Oblast, as well as entire Russian Federation; digital environmental education as a tool for solving the problem of waste separate collection.

Learning how to solve environmental problems has long gone beyond formal classes. The combination of traditional teaching methods in the nature, and with the use of ICT tools, such as mobile applications, online maps and navigation, interactive elements of museum exhibits, allow motivated participants of the educational process to obtain integrated environmental development. The global trend towards environmental awareness seems to be a favorable event to the authors of this article. Developing green thinking from an early age would bring environmental socioeconomic sustainability into the future.

Environmental education is explored by educational institutions, specialized services, initiative organizations, and with the participation of volunteers. At the same time, various tools for transferring knowledge are involved: educational standards, face-to-face contact with the environment (i.e., in the nature), promotions and competitions, the mass media, and ICT. An importance of each of these tools should be emphasized in the ecological culture formation in contemporary Russian society.

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