VII International Forum on Teacher Education

Network educational environmental projects in vocational education during a pandemic

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Abstract

The problem is urgent due to the need to ensure the quality of students' vocational education in the context of the extreme transition of universities to distance learning. These circumstances predetermine the need to search for promising information and communication technologies that ensure the achievement of educational results. Scientific researches indicate that network educational environmental projects have significant potential in achieving the required educational outcomes. However, insufficient knowledge of processes of organizing and managing network educational environmental projects limits possibilities of their application in vocational education. The purpose of the article is to describe the essence, structure and typological characteristics of network educational environmental projects based on the experience of their implementation in the educational process at university. The authors used the following research methods: retrospective analysis and generalization of pedagogical works made it possible to identify the essence, structure and basic grounds for the classification of network educational environmental projects; the questionnaire of students and teachers studied their attitude to project activities, the results showed prospects of using network educational environmental projects in vocational education. The study reveals the specificity, structure, principles and functions of network educational environmental projects. The research results can be used for preparing teaching materials at university in traditional and distance learning, organizing and conducting network all-Russian and international educational projects, including projects of an environmental focus, in order to improve the quality and practical orientation of vocational education.

Keywords: network educational environmental project, quality of vocational education, bachelors, federal state educational standard of higher education, information and communication technologies.

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Introduction

The relevance of the problem under study is due to the need to ensure the quality of students' vocational education in the context of the rapid transition of universities to a completely distance learning format. In this regard, it is of great importance the search and application of modern information and communication technologies in the educational process (Ilyina, 2020; Kiselev, 2020, Shalaginova & Dekina, 2020, Smirnova, 2020, Krasovskaya & Izabekova, 2017; Kiselev, 2019), which ensure the achievement of main results of mastering the educational program - students' professional competencies, in accordance with the requirements of the labor market and updated federal state educational standards of higher education. Scientific works indicate that network educational environmental projects have significant potential in achieving the required educational outcomes. To solve this problem, the article will justify prospects of using network educational environmental projects while training future ecologists in the era of a pandemic.

Purpose and objectives of the study

The study examines the content, principles and functions, structure and typology of network educational environmental projects, which make it possible to establish pedagogical opportunities for achieving educational results. The authors underline risks that the subjects of the educational process may face in the process of their implementation at the university.

The research had the following tasks:

1.   to study the essence and structure of network educational environmental projects at the university;

2.   to identify specific features of the implementation of network educational environmental projects at university;

3.   to develop a classification of network educational environmental projects on various grounds.

Literature review

According to researchers, the integration of information and communication technologies (ICT) and activities for the creation of educational projects contributes to expanding boundaries of educational activities at the interregional and international levels (Selevko, 2005; Fuicu, Popa, Dobrilovic, Marcu, & Bogdan, 2017).

The experience of implementing telecommunication projects has shown their effectiveness in the development of: environmental (Bramwell-Lalor, Ferguson, Gentles, & Roofe, 2020) and professional competencies (Obydenkova, 2016) of students, as well as a wide range of skills: research, information and communication, creation (Serostanova, 2014; Yustina, Syafii, & Vebrianto, 2020). As a result, it contributes to the professional development of students as future specialists (Shilova, 2006; Samerkhanova, Krupoderova, Krupoderova, Bakhtiyarova, & Ponachugin, 2016).

In scientific articles, an educational project is considered to be a set of methodological, organizational, financial and educational activities aimed to achieve planned results of mastering the educational program (Romanova, 2013; Sedykh, 2018). From the point of the competence-based approach, an educational project is a purposeful type of activity, when students apply new knowledge, skills and attitudes by solving a (project) problem and obtaining an educational product for a certain period of time and with limited resources (Alink & Berg, 2013; Chechel, Grabar, & Monakhova, 2015).

Network educational projects are joint, planned activities (information retrieval, experimental research, analytical), organized through the use of ICT (Isakhanyan, 2013; Patarakin & Shilova, 2015; Chistobaeva, 2017; Pavlova, 2009). As a rule, such activities have a democratic style of interaction, the remote nature of communications by means of ICT and their aim is to achieve an educational result - students' competence (Zavarzina, Kulbakh, & Zinkevich, 2013; Adamsky, Mokievskaya, & Zaitsev, 2013; Akhayan, 2001; Osipova, 2008).

The authors note that network projects create an opportunity for exchanging experience between students of other educational organizations, intercultural communication, acquisition of new knowledge, skills in solving problems (Polat, 2008), increase motivation by applying new ways of presenting the material covered in the network (Shamsutdinova, 2013), ensure the interactivity of the subjects of the educational process and students' personal productive activity (Karimova, 2016).

In the environmental education system, special attention is paid to the implementation of international network environmental projects for sustainable development: Baltic Sea Project, Grön Flagg, The Baltic University Program, etc. (Grigorieva, 2014; Ardoin, Bowers, Roth, & Holthuis, 2018). This is due to the complex and global nature of environmental problems that require international cooperation in their solution.

In scientific works, environmental projects are activities involving the maintenance and improvement of the quality of the natural environment; as a complex of organizational, legal, economic, technical, educational and other measures aimed to minimize the negative impact of anthropogenic activities (Konstantinova, 2017); as a process of creating projects of various sizes (Ksenofontov, 2014). Such a multiple characteristic indicates the importance of an environmental project as a form of organizing the educational process at university (Kalinin & Toropova, 2020; Andryukhina, Fadeeva, & De Negri, 2017).

While working at an environmental project, students' creativity increases, an emotional-value attitude towards nature is formed (Mukhlynkina, 2015), a desire for continuous learning arises, the ability to identify environmental problems and to take an active part in solving them is formed (Genc, 2015).

According to researchers, the description of the structure, which includes a set of elements (parts) of the project, is of fundamental importance for the effective organization of network educational environmental projects. There are the following elements in scientific works: search for an urgent problem, setting of the goal and objectives of the study, methods and solutions; clarification of staging, definition of time frames and intermediate results, organizational structure; presentation of the project and its assessment (Nesgovorova, 2013; Mikhalkina, Nikitaeva, & Kosolapova, 2016; Kotova, 2017, Kiryakova, 2011). It is important to clarify that the number and sequence of structural elements depends on the topic, goals, objectives and typology of the project.

When carrying out a project, the organizer must indicate the conditions of registration for participants (technical, organizational, financial, temporary); to plan forms of interaction between the subjects of the educational process; establish criteria for evaluating project performance (Khutorskoy, 2001). An important requirement is the need to place the finished product of the project in the global network (Sergeev, 2009).

In pedagogical articles there are different approaches to classifying projects. Many authors rely on the generally accepted classification (Polat, 2008) and expand the content of existing types of projects based on their own subject of scientific research.

The authors point out the following basic features for classifying projects: the dominant research method in the project (creative, informational, applied, etc.); subject area (monoprojects and interdisciplinary); the nature of contacts (regional, international, telecommunications), scale (small, medium, megaprojects); duration of implementation (short-term, long-term and medium-term); number of participants (individual, group); coordination in the project (explicit and implicit) (Polat, 2008, Konshunova, 2013); by focus (innovative, environmental, educational, developmental) (Belyakov, Voskresenskaya, & Ioffe, 2011);

by level of originality (low and high level of novelty) (Marabayeva & Aranovich, 2011); by place of learning (classroom, extracurricular activities) (Kanyanina, Krupoderova, & Stepanova, 2017); by platform for project implementation (WEB 1.0 and WEB 2.0) and communication language (native and foreign) (Petrishcheva, 2010), by the purpose of using ICT (search for necessary information; communication; placement of the project product) (Obydenkova, 2016).

Having summarized all of the above and analyzed the experience of implementing projects by means of ICT, it can be noted that the specifics of network educational projects of an environmental focus are insufficiently studied, which limits the possibilities of their active use in vocational education during a pandemic.

Methodology

There are following approaches on the basis of which the process of managing the integration of network educational environmental projects into educational activities can be built:

- a systemic approach, characterizing the integration process as a system consisting of interrelated elements (including subjects, objects, management processes);

- a process approach, assuming the presence of interrelated stages in the implementation of projects: organizational - preparatory, analytical, technological, presentation and control;

- an integrated approach that takes into account the influence of external (political, economic, social, epidemiological) and internal factors (limited resources, relationships between participants, motivation), which are key to completing the project and achieving educational results.

These approaches are not sufficient, the number and prevalence of one or another approach depends on the specifics of the network educational environmental project, focus, typology, goals and objectives, subjects of the educational process.

Characterizing network educational environmental projects, we present them as a set of principles and functions that make it possible to identify pedagogical possibilities of their application in vocational education.

The main functions of network educational environmental projects are:

- selective: provides a wide selection, storage and placement of educational content by means of network services;

- motivation-value: forms students' value attitude to the environment, contributes to the development of cognitive interests and personal qualities;

- dialogical: ensures the development of students' readiness for cooperation in achieving a common goal;

- control and diagnostic: allows to quickly assess and monitor the achievement of educational results, carry out their correction;

- adaptive: allows to create conditions for students' self-education, taking into account not only individual opportunities and educational needs, but also requirements for graduates in the labor market;

- ecosystem: assumes interdisciplinary integration of knowledge to find the best ways to reduce negative factors and improve the state of the environment.

Among the principles of organizing activities for the implementation of network educational environmental projects, we underline the following:

- the problem principle assumes the presence of a problem situation in the project, which is focused on solving problems close to the future professional activity of the graduate;

- the principle of taking into account the external environment of the project implies the need to take into account interests and needs (educational, personal, professional, social) of other project participants;

- the principle of security implies the need for resources for the implementation of projects: information and communication, temporary, personal, financial, etc.;

- the principle of nonlinearity and fragmentation of network structures allows to get a quick access to a large amount of information, and the variable nature of its presentation makes it possible for students to independently choose an educational trajectory;

- the principle of heterogeneity of network content presupposes a combination of verbal and non-verbal ways of presenting environmental information, which contributes to increasing the accessibility of its perception and reducing the text space;

- the principle of automation of information flows involves using computer telecommunication means for preparation, transmission and dissemination of information on the project in the process of implementation;

- the principle of productivity is due to the creation of an application product and its placement on the network;

- the principle of uncertainty assumes the possibility of detecting risks, which makes it possible to predict consequences of economic activities on the environment;

- the principle of amateur performance assumes the independence of students in classroom and extracurricular work on the project;

- the principle of structuring the content of the project assumes the detailing of work with an indication of intermediate results at each stage, and the timing of their implementation;

- the principle of iteration assumes that during the implementation of the project it is necessary to constantly return to the previous stages to analyze information about intermediate results and make changes to the process;

- the principle of integrity presupposes the unity of pedagogical conditions at all stages of project implementation, and ensuring the interconnection of its structural elements in accordance with the purpose of the project.

Network educational environmental projects are considered to be an environmentally oriented educational activity, organized on the basis of computer telecommunications, involving remote interaction of students, having clear goals, limited time, financial resources and aimed to achieve specific educational results, including a body of knowledge about nature conservation and presupposing professional self-realization of the student's personality.

The leading research methods are:

- theoretical: a retrospective analysis and generalization of pedagogical literature made it possible to identify the essence, structure and basic foundations for the classification of network educational environmental projects; analysis of federal state educational standards of higher education in terms of the requirements for the results of mastering the educational program, which must be achieved when using network educational environmental projects, the deduction method made it possible to formulate the definition of a network educational environmental project;

- empirical: analogy methods, including the analysis of the experience of implementing other projects, made it possible to identify potential risks of network educational environmental projects; content analysis of vacancies and expert assessment of the requirements for specialists in the field of ensuring environmental safety made it possible to specify the list of competencies in demand among graduates;

a questionnaire survey of students and teachers assumed the study and analysis of the most effective forms of organizing the educational process during a pandemic. The results obtained indicate the prospects of using network educational environmental projects in vocational education, making possible risks minimal.

To analyze the prospects of using network educational environmental projects during a pandemic, the authors conducted a survey of teachers (20 people) of VyatSU (Table 1) and a questionnaire of students (60 people) in the areas of training 03/05/06 Ecology and nature management and 03/20/01 Technosphere safety (undergraduate level). The participants were fully informed about the study and their participation in it was voluntary.

Results

The results of the survey can be seen in the Table 1.

Table 1. Results of a survey of teachers about the prospects of project activities.

Answers	Percentage of teachers
How do you feel about project activities?	
Positive	70%
Negative	0%
Indifferent	30%
How often do you use the project method in the educational process?	
Regularly	30%
Sometimes	50%
Hardly ever	20%
What difficulties did you encounter in your project activities?	
Students have no interest and motivation to take part in project activities	30%
Lack of the necessary educational and methodological support for the organization of project activities	20%
Low level of students' self-organization and self-control	50%
Difficult to say	0%
What types of projects do you use in the educational process?	

Individual	75%
Group	25%
Network	0%
Do you consider network educational environmental projects to be a promising means of forming professional competencies among students during a pandemic?	
Yes	65%
No	10%
Difficult to say	25%

It has been found out that 70% of teachers have a positive attitude to project activities, while 30% regularly use it in the educational process, 50% - sometimes and 20% - extremely rarely. In the process of organizing project activities, 50% of teachers encountered a low level of self-organization and self-control among students, 30% of teachers marked low motivation of students during the implementation of the project, 20% of teachers noted that they did not have the necessary teaching materials to ensure a high-quality organization of the project activities. The most common form of the project implementation is individual projects (75% of teachers), 25% prefer group work. It should be noted that teachers do not use the network form of projects in the educational process. However, 65% of teachers note that during a pandemic, network educational environmental projects are a promising means of achieving educational results, 10% do not think so, 25% find it difficult to answer, which may be due to the lack of experience in implementing such projects and understanding specifics of their organization.

Table 2 presents the results of a survey of students, which shows that the majority of students (63.3%) have a positive attitude to the use of project activities in the educational process, 33.3% note that participation in the project allows them to develop their professional and managerial competencies, 26, 7% - to form communication skills, 15% - self-control skills, 11.7 - to work at an individual pace. It should be noted that in the process of project activities, 35% of students did not fully understand its significance, 28.3% noted that the projects developed were not implemented in practice, 16.7% of students reported a lack of comprehensive support from the teacher and 20% noted the complexity in the implementation of projects. It is worth pointing out that students mainly carried out individual projects - 65%, 35% of students took part in a group project, while none of the respondents had ever participated in the implementation of network educational environmental projects. Taking into account the fact that 26.7% of students strive to develop communication skills, 45% of students expressed their readiness to take part in network educational environmental projects, 25% of students expressed their unwillingness and 30% found it difficult to answer, as they did not have a proper understanding of the specifics.

Table 2. The results of the students' questionnaire about the prospects of project activities.

Possible answers	Percentage of students
How do you feel about project activity as a way of learning?	
Positive	63,3%
Negative	11,7%
Neutral	25,0%
What attracts you more in project activities?	
Ability to work at an individual pace	11,7%
Opportunity to develop self-control skills	15,0%
Possibility of creative self-realization	13,3%
Opportunity to develop professional and managerial competencies	33,3%
Ability to develop communication skills	26,7%
Difficult to say	0,0%
What difficulties did you encounter while implementing the project?	
There was no feedback from the teacher	16,7%
Projects were not implemented in practice	28,3%
No understanding of the essence and purpose of project activities	35,0%
Time and labour consuming of the project	20,0%
What types of projects have you had in the educational process?	
Individual	65,0%
Group	35,0%
Network	0%
Would you like to take part in a network educational environmental project?	
Yes, it is interesting to acquire new knowledge, useful experience, to communicate with new people	45%
No	25%
Difficult to say	30%

Thus, the analysis has shown a high interest in project activities both among students (63.3%) and teachers (70%). However, there are a number of difficulties that most students face in the process of project activities, namely: there is no clear understanding of its purpose (35%).

This is due to the fact that projects in most cases are not implemented in practice, so students cannot evaluate the effectiveness of the final product, which is the goal of the project activity. The lack of the necessary support from the teacher, noted by students (16.7%), determines the complexity of its implementation (20%). Accordingly, in order to effectively organize and conduct a network educational environmental project (45% of students would like to take part in it) the teacher needs to provide timely information and technical support at all stages of its implementation, which in turn actualizes the need to identify the typological features of these projects, including requirements for their structural components.

The structure of network educational environmental projects partially coincides with the logic of scientific research and includes a theoretical and procedural part.

The theoretical part contains:

- the theme of the project and arguments for its relevance in accordance with current trends in the field of the environment;

- definition of the project problem;

- the purpose of the project and the final product;

- the hypothesis;

- tasks that reflect the sequence of the main stages of the project;

- research methods;

- project plan (resources, risks, roles and responsibilities of participants; duration of the project, stages of activity).

The procedural part consists of the elements:

- processes for the work on the project, according to the schedule;

- report on the project;

- project design and placement on the network;

- research perspectives.

Characterizing the specifics of network educational environmental projects, we note the following features:

- the predetermination of the project by the collective nature of the activity. The subjects include teachers, researchers, representatives of public environmental organizations, employers and students;

- objects are works (activities) in the process of which students create unique products;

- the diversity of subjects implies the provision of technical support, coordination of work, communication and motivation of participants, assistance in solving problems;

- the territorial remoteness of the participants implies the creation of an educational platform in the network for the interaction of participants, discussion of issues related to the possibility of collecting and analyzing environmental data from different regions; creation of products upon completion of the project, which are placed only in digital format (video and audio, graphic, etc.).

These features indicate a high probability of risks arising in the process of implementing network educational environmental projects. So, the low level of formation of competencies in the field of ICT among students, the lack of high-speed communication channels will limit the possibility of using the electronic resources of the network; lack of online / offline support for participants will lead to inconsistent interactions. A high load, a decrease in motivation and control of independent activity, due to the transition to a distance learning format, can lead to an early termination of participation in the project. Decentralization of management and the independent nature of the interaction of project participants can lead to untimely placement of information or its fragmented presentation, which will affect the timing and quality of results. Lack of interest of the leadership of universities and teachers in the implementation of the project will lead to the absence of students from other regions.

Awareness and leveling of these risks will ensure the effectiveness of implementing network educational environmental projects and the achievement of the planned results of education.

A comparative analysis of various types of projects has made it possible to develop a classification of network educational environmental projects.

Characterizing the network educational environmental projects in terms of the direction of the formed structural component of professional competencies among bachelors, we can single out:

- research projects aimed to change the motivation-value and cognitive components. These projects contribute to the acquisition and assimilation of knowledge through the active exchange of information between its participants and increase the motivation of students through the multimedia nature of educational content.

The product of the project can be research work in the field of environmental protection, environmental education, an article, a multimedia presentation, etc.;

- creative projects focused on changing the motivation-value and reflexive-evaluative components. This type of project contributes to the development of creative potential, the formation of critical thinking, and the ability to interact with other project participants. The project product can be a video film, animation, blog, reportage, competition, excursion, etc.;

- practice-oriented projects have a pragmatic focus and are associated with the future professional activities of the graduate. The result of the project can be developed sites, design solutions, layouts, models, manuals, schemes, technologies that have practical application in the field of resource conservation, environmental safety, recycling of production and consumption waste.

Considering projects by the nature of the changes, we can distinguish:

- innovative projects aimed to develop and implement completely new environmental technologies, devices and solutions;

- modifying projects focused on improving the quantitative and qualitative characteristics of materials, objects, substances that help reduce the negative impact on the environment;

- standard projects, suggesting to change methods of carrying out and methods for assessing the degree of hazard of pollutants.

By target orientation, projects can be divided into:

- projects aimed to create the network databases on the sources of anthropogenic impact;

- projects aimed to environmental education (master classes, excursions, actions) and the popularization of environmental ideas.

According to the subject-content area, projects can be:

- based on getting and analyzing of environmental information about the components of the natural environment;

- based on studying pollution sources (emissions, discharges, production and consumption waste).

Characterizing the network educational environmental projects by the access to their content, there are:

- open projects, when access to the content of the project is open to any network user;

- closed projects, when access to the content of the project is fully or partially restricted for individual users.

By differences in network educational environmental projects in terms of duration, there are:

- short-term projects implemented during the semester;

- medium-term projects -during an academic year;

- long-term projects - from one year or more.

By the type of complexity, network educational environmental projects are:

- organizationally complex when a large number of participants and the self-regulating nature of interaction suggests difficulties in organizing, coordinating and managing;

- technically complex due to technical difficulties when using computer telecommunications;

- complex due to a set of problems in the organizational and technical plans.

By geography of participants, there are:

- local projects organized at the university level;

- regional projects involving the participation of students from any subject of the country;

- international projects involving interpersonal and intercultural networking between students from different countries and continents on environmental issues.

By methods of communication between the participants, there are:

- projects with asynchronous communication associated with the ability to receive and transmit the necessary information at a convenient time for each participant in the network educational environmental project;

- projects with synchronous communication aimed at the possibility of direct communication between project participants in real time.

Characterizing educational environmental projects for choosing a network site, there are:

- information sites which are a virtual space consisting of logically connected web pages, united by a common theme, design, purpose, and navigation;

- forums which are created by project participants of a specific topic related to the implementation of the project and discussion by posting messages within this topic;

- a blog which is a space on the network when both a user and project participants can regularly post useful information;

- social networks which provide a platform for creating communities, posting information about the project, following the news, exchanging content (documents, links, images, video and audio recordings), adding comments to materials.

- a combined network site, a result of using tools from several sites.

Thus, for the effective use of network educational environmental projects in the educational process during a pandemic, based on the requirements of updated federal state educational standards and requirements for graduates in the labor market, it is necessary to determine a list of professional competencies that can be formed in the process of creating and implementing network educational environmental project; to choose an urgent environmental problem that can be solved within the framework of students' cooperation from different countries and regions; to create a network platform, taking into account the specifics of network educational environmental projects, allowing the organizers of the project to minimize risks that prevent its successful implementation in achieving the main goal of the project - quality of vocational education.

Discussion

The problem of improving the quality of students' vocational education through the implementation of environmental projects has been the subject of many researches (Kalinin, & Toropova, 2020; Andryukhina et al., 2017; Mukhlynkina, 2015; Genc, 2015), but federal state standards in accordance with professional standards define new requirements for educational outcomes. Thus, a graduate in the field of nature conservation must have skills to work with various software products; work with databases for storing and searching information in global computer networks; remotely carry out environmental audits; network communication skills. In addition, the extreme transition of universities to distance learning has accelerated the integration of ICT into educational activities.

In new conditions, it is necessary not only to search for promising forms of organizing the educational process, as we consider network educational environmental projects, but also to provide their methodological support for the dissemination of experience in their application in vocational education.

Conclusion

The research made it possible to determine that network educational environmental projects are activities organized by means of computer telecommunications, involving a large number of subjects, their territorial remoteness, self-regulating nature of interaction, limited time and financial resources. The implementation of projects helps to increase the creative and cognitive activity of students; develop skills and abilities to identify, analyze, integrate and visualize environmental information by means of ICT, to develop different ways to solve environmental problems; make management decisions in situations of uncertainty and scarcity of resources. Variety of communication methods between students allows to form skills and abilities of working in a team which contributes to the expansion of the practical experience of environmental protection. As a result, this predetermines the graduate's readiness for future professional activity and the demand in the labor market.

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