Project Management and Agile Technology in Environmental Science and Sustainable Development in the "University – Employer – Region" System

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Abstract. In this article, the authors present the outcomes of three years of their scientific work on the formulation of a research hypothesis, the formation of project research groups, and the presentation of the outcome to groups of "customers": employers and/or regions. An interdisciplinary approach was applied in this work, which allowed to integrate environmental, economic, and social research methods. The objectives of the study were to determine the range of the relevant research topics in environmental science and sustainable development and formation of cases; to perform the personal and collective work in the project group; to form the skill of working with topic experts and documents in students; and to verify the work and present to the customer. The youth modeling of international and national processes and events, project laboratories, and cases obtained in the course of the study were presented in this work.

1 Introduction

The relevance of the presented work consists in adapting the topic of education for sustainable development to various teaching forms and methods. The interdisciplinary approach used as integrating the economic, social, and environmental agenda was applied in the research within the project works [1, 2].

The project approach to teaching is dictated by the active transition of universities to the introduction of the ideology of social projecting and the active position of universities in fulfilling their "third mission" – social responsibility to the region and the entire country. For example, frontier universities in Russia (ten federal and some core universities) switched to
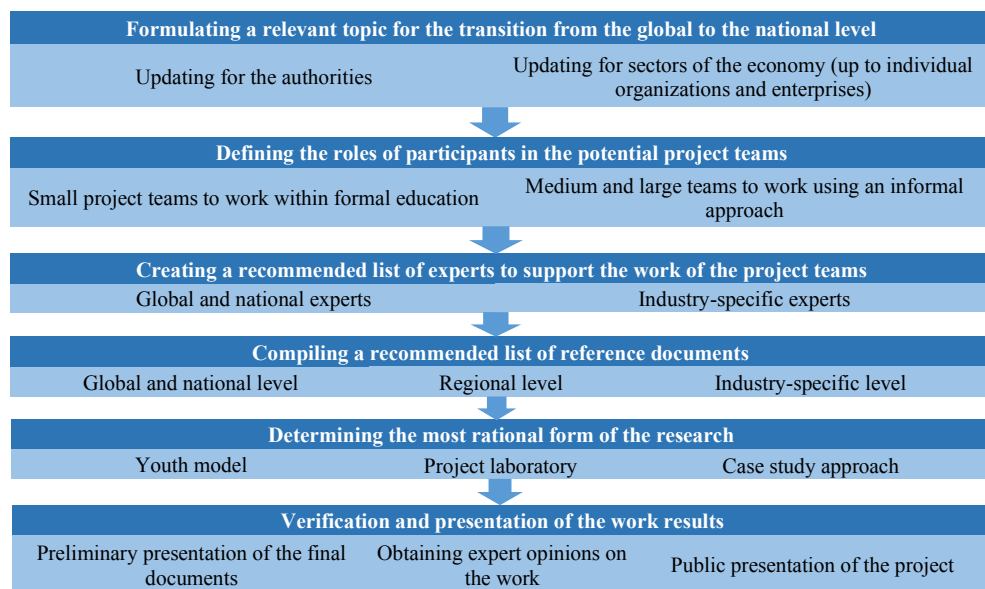
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a system of project-based education, where the project is a separate academic discipline valuated in "credits" to be credited to the student, and the project is be presented to a potential "customer" – the employer or the region – at the end of the research. The problem has arisen for universities regarding finding potential "customers" that could correctly break down their large research projects into small research items (parts) and offer them to universities as small project tasks "worth" two to six credits to allow each student to choose an interesting subject and depth of immersion convenient to their personal educational path. Such project-based work is often implemented using the eduScrum technology [3].

The process of higher education currently requires the introduction of the Agile technologies and the eduScrum educational environment. With this purpose, it was proposed to introduce a project-based approach in various types of formal education and in the informal approach [4]. Students are immersed in the subject of the sustainable development goals (SDGs), conduct research on environmental issues, simultaneously determining which objectives of which SDGs they correspond to, and explore the parameters of the possibility of achieving the SDGs by various methods. Teachers and employers should be able to evaluate the product (educational) result and develop mechanisms for the most flexible work with it [9 – 16]. The elements of the Agile Manifesto are relevant, because the "customer" cannot always clearly state the idea of the study and the form of presenting the expected results.

2 Methods

A methodological approach to developing a more or less universal approach has been developed, which can be recommended to Russian universities as a rational form of the project-based work on the topic of Sustainable Development with a special emphasis on the topic of the SDG Environmental Cluster, because global and regional environmental problems are considered to be the most significant for the transformation of society, especially in the face of the increasing instability amid the global pandemic. The methodology consists of a set of the following steps (Figure 1).

Formulating a relevant topic for the transition from the global to the national level	
Updating for the authorities	Updating for sectors of the economy (up to individual organizations and enterprises)

Defining the roles of participants in the potential project teams	
Small project teams to work within formal education	Medium and large teams to work using an informal approach

Creating a recommended list of experts to support the work of the project teams	
Global and national experts	Industry-specific experts

Compiling a recommended list of reference documents		
Global and national level	Regional level	Industry-specific level

Determining the most rational form of the research		
Youth model	Project laboratory	Case study approach

Verification and presentation of the work results		
Preliminary presentation of the final documents	Obtaining expert opinions on the work	Public presentation of the project

Figure 1. Methodology of the project-based work in the "university – employer – region" system

3 Results and discussion

Twenty major projects have been implemented over three years, which allows to present the works in clusters that will help the participants in the further process formulate their own research and apply the methodology in their project field (Table 1).

Table 1. Clusters of the project work in Environmental Science and Sustainable Development

Global agenda / National agenda	Types of events	Work methods, results
Form of organization: Youth model		
COP 21 (signing of the Paris Agreement)	Youth model of the international climate negotiations	A complete simulation model of working groups and the negotiation process. It took six days of work of 147 people from 42 universities in Russia. The Youth Agreement on Climate was signed.
8th World Water Forum	Youth model of the World Water Forum	A complete simulation model of working groups and the negotiation process. It took four days of work of 87 people from 142 universities in Russia. The Youth Declaration on Supporting SDGs was signed.
Development of the territory with the UNESCO World Heritage status	Youth development strategy for the Baikal region "BAIKAL 2030: Regional refraction of the SDGs"	The event was hold by the invitation of the Government and the Governor of the Irkutsk region. Six working groups on the problem areas in the region participated in the event. The recommendations were developed by the youth government doubles to the current Government of the Irkutsk region. A mechanism was established for a dialogue between decision makers in the region and the youth on the SDGs. The jury was headed by the Director of the UN Information Center in Moscow.
Arctic Council	Youth model of the project office "Sustainable development of the Russian Arctic".	The event was held as part of the International Forum "Days of the Arctic in Moscow" on November 22, 2018. Six largest Moscow universities selected a Russian region of the Arctic zone and presented their solutions. A total of nine teams participated (equal to the number of the Russian Arctic regions). The total number of players was 100 people. There were more than 100 spectator fans. The task for the participants contained three blocks: to conduct a strategic analysis according to the Methodology of the Ministry of Economic Development of the Russian Federation; and to formulate regional indicators for achieving the UN SDGs on five vectors: Economic, energy and transport security, Sustainable environmental management and environmental security, Food and agriculture security, and Personnel training for the region. The proposals for the implementation of roadmaps of the National Technology Initiative were developed. The Youth Declaration on Sustainable Development of the Russian Arctic

		was signed in support of the 2030 Agenda for Sustainable Development.
Form of organization: Project laboratory		
Regional refraction of the SDGs	"The UN sustainable development goals: Volga dimension." Youth strategy "Volga – 2030".	Three universities were involved. The goal of the project office was to identify the focus of complex issues related to environmental management in the regions and to develop a roadmap to overcome them for each of the identified Project regions in order to achieve the UN SDGs.
Global energy transition	Youth model of the sustainable energy supply in the federal districts of the Russian Federation "Sustainable energy security of the Russian Federation 2030".	The event was held with the assistance of the Organizing Committee of the Russian Energy Week and the BRICS Youth Energy Agency. The model involved more than 100 students from four universities. Eight teams were created, each representing one of the selected federal districts of the Russian Federation; a full strategic analysis of the current situation was carried out; and the Strategy for the energy sustainability development of the federal districts of the Russian Federation and a roadmap for its achievement were developed. The Youth Declaration on Sustainable Energy Security of the Russian Federation was signed.
Agenda 2030	Youth team of the country. The UN sustainable development goals: federal dimension	The event was held by the invitation of the Federal Agency Russian Youth and involved leaders of the youth governments of the Russian Federation from 76 regions. More than 160 people representing doubles of the regional governments were involved, each working for their own real federal district. The work of the working group of the youth governments from eight federal districts of the Russian Federation was simulated to draw up a roadmap to achieve the SDGs in the federal districts. The Memorandum on the SDGs Promotion in the regions of the Russian Federation was signed.
Academic activities of universities	Opportunities and prospects of science for achieving the UN sustainable development goals: thematic reflection of the SDGs	The event was held by the invitation of the Ministry of Education and Science of the Russian Federation. The student scientific societies from 11 federal universities were involved. More than 250 participants took part in the event: 11 teams of the student scientific societies from the Russian universities. The scientific achievements and projects of the Russian universities for the achievement of the SDGs by Russia were identified. The mechanism of cooperation of the student scientific societies from the Russian universities to achieve the SDGs at the national and regional levels was proposed. The Declaration on the SDGs Promotion through Scientific Activities in the System of Student Scientific Societies in the Russian Federation was signed.

Form of organization: Case study approach		
Global climate agenda	World Café Operation Adaptation: Climatic Vagaries and Sustainability of Cities	The event was held as part of the III Climate Forum of Cities (Moscow) in September 2019. The facilitation was based on the need to analyze climatic risks that arose in cities located in various natural zones. The players were offered to conduct an analysis of the potential natural and man-made risks for cities within each of the natural zones of the Russian cities; to study the set of problems in the economic complex of cities; to study the set of problems in the natural complex of cities; and to explore the best Russian and foreign practices to overcome urban problems. The results were presented in the form of a presentation report from each team. The work of the teams was evaluated by 12 experts who commented on the results of the facilitation and expressed their recommendations to the players of The World Café. The teams from five Russian universities (37 people) participated in the event.
Agenda SDG 15, Environmental protection and implementation of the National project Environmental Science	On-site research-to-practice school of the MGIMO of the MFA of the Russian Federation "Environmental tourism for sustainable development of the Omsk region"	The school was organized jointly by the MGIMO of the MFA of Russia, the Omsk branch of the Russian Geographical Society, and the Omsk Quantorium. A total of 50 participants took part in the event (students of higher educational institutions, vocational educational institutions and high schools) over seven days (two lecture days, two on-site days, two days of case studies, and one day for the project presentation). The work was performed in four thematic working groups. The Government of the Omsk region and the local branch of the Russian Geographical Society submitted a plan for the implementation of sustainable tourism eco-routes.

According to the methodology of arranging the works, the university formulated the proposal to the participants in the event (to the Organizing Committee) or received an invitation from a potential customer to formulate a relevant topic and train teams for a major event.

Such case studies as "Complementarity of the environmental agenda of the Russian regions with the UN SDGs" and "Implementation of the national project "Environmental Science": the possibility of implementing the Sustainable Development Goals within the national agenda in Russia" were deeply integrated into the educational process

4 Conclusion

The pedagogical technology has been developed in three formats to promote the SDG agenda in Russia: youth modeling, project laboratory, and case studies. In each case, the choice is made jointly by the event organizer (or the university) and the customer. The obtained result is presented in writing (as a review, a report, an analytical note, etc.), and the public presentation of the project is also provided. As a result, students get the opportunity to

undergo practical trainings or internships (with remuneration) in the organizations that took part in the project activities. The Youth Declaration on Supporting SDGs has also been signed as a result.

A range of the relevant research topics in environmental science and sustainable development has been identified, and the methodology for formulating game cases has been developed. The methodology for the implementation of personal and collective work in project teams has been developed, the skills of working with relevant experts and documents have been formed in students, the works have been verified, and the process of presenting them to customers has been worked out.

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