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## Active Learning Methods In Environmental Education Of Students Olga Derevenskaia<sup>a</sup>

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### Abstract

The author evaluates the experience of active learning methods application in environmental education of school pupils. Project-based learning is widely used in training of students at universities. However, in high school this method is rarely used due to the fact that it is difficult to combine the project tasks with education requirements. We used the innovative method of learning in the system of supplementary education. The task of assessing ecological conditions of the river Kazanka (the city of Kazan) was given to a group of students; it included special complex of indicators. In the process of the project execution the students were involved into the solution of problems close to professional ones. It helped to intensify the learning process and to encourage students to participate creatively. Use of the project method allowed students to learn the ecologic and biological disciplines more effectively and deeply, to form a systematic approach for research work, to develop practical skills, and it also helped to bring up psychology of responsibility of students in the regional environment. Thus, our experience of using the project method shows promising character of its application in the system of supplementary education of students in secondary schools. The use of modern educational technology and active learning in environmental education is extremely important, as they can be used to conduct effective training and professional orientation of students.

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### Introduction

Solving the problem of preserving the environment and preventing environmental crisis is largely determined by the human factor - the ideology, culture and environmental awareness of people. In connection with this, it's necessary to give a lot of attention to environmental education and training, including a period of study at school.

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The teaching of such discipline as ecology in supplementary educational system can be completely organized using techniques with the active role of students.

Active methods are the form of interaction between students and teachers where two sides interact with each other in the course of classes; students are not passive listeners, but active participants of the process (Stolyarenko, 2000). Project-based learning is one of the active learning methods. The project is a set of specific actions, documents, pre-texts, the idea to create different kinds of theoretical products or real objects. It's always creative activity (Polat, Moiseeva, 1998). Projects' method always presupposes, first of all, solution of the problem, and, secondly, it's directed at obtaining the result.

Development of cognitive and creative skills of the trainees, critical thinking, ability to construct their own knowledge, to be oriented in the information space is in the basis of the projects. Basic requirements for the use of the project method are the following: the presence of a significant problem in terms of creativity, which requires an integrated knowledge of the research results for its solutions; practical, theoretical, cognitive significance of the expected results; the independent activity of students; the identification of the ultimate goals of joint or individual projects, the identification of basic knowledge of various areas which are necessary to work on the project; outlining the contents of the project; the application of research methods - the identification of the problem and objectives of the research hypotheses of their solutions, discussion of research methods, deliverables, data analysis, summary, correction, conclusions (Mingazova 2008 ).

Project-based learning is widely used in many countries around the world, as far as it allows to integrate the knowledge of students from different areas for the solution of a problem, makes it possible to apply this knowledge in practice. This method is focused on active cognitive and creative students' work so to solve a common problem, including in their free time. Project-based learning involves the use of a wide range of problem, research, and search methods, focused on the real practical result. Project technique forms the ability to work with scientific and academic books, learn to focus on major, substantive aspects of the research problem, propose and test hypotheses, defend someone's point of view, offer someone's views on the issues under investigation. In addition, the project teaches to present the results of work, which is very important, as far as the success of the project greatly depends on the good presentation (Guzeev, 1996).

Project-based learning is widely used in training of university students, but it's rarely used in secondary school because it is difficult to combine the project tasks with education requirements. We used an innovative method of active learning in supplementary education in order to enhance the learning process, to encourage students for creatively participation. The purpose of this article is to discuss the possibility of applying the method of projects in environmental education to schoolchildren in the system of supplementary education, to identify the advantages and disadvantages of the method, to make recommendations for its use.

## **2. Methods**

Studies were carried out in 2010-2012. 30 people (2 groups) took part in the project. Work on the project was held in their free time. The work was done on the basis of laboratory of water ecosystems optimization of Kazan (Volga Region) Federal University. We set the task for the students to assess the ecological condition of the river Kazanka in the city of Kazan on a set of indicators. We deliberately chose the work as the research issue that involves the training of techniques of measurement the environmental quality benchmarks and assess the environmental condition of the river on a set of indicators. Ecological meaning of works of this direction is to reveal the presence of contaminants and to assess their impact on various components of the ecosystem, to consider ways to dispose pollutants in ecosystems.

Investigations were carried out in the river Kazanka in summer in 2010-2012. Water temperature, conductivity, dissolved oxygen content, pH, were measured on 6 stations every month. Students chose zooplankton and benthos. Further processing of the material was carried out according to standard procedures. Evaluation of the ecological condition of the river was carried out by comparing the obtained data with the classification scales. More details of the methodology and the results obtained were presented in the earlier paper (Derevenskaya and Yakovlev, 2013; Mingazova et al, 2013).

## **3. Results and Discussions**

During the course of the project students focus on the following stages: preparation, planning, research, obtaining the results, drawing conclusions, evaluation of results and process (Table 1)

Table 1 The stages involved in project-based method (Guzeev, 2000)

| №  | Stages                            | Contents   |
|----|-----------------------------------|--|
| 1. | Preparation                       | Identifying the problem and the subsequent goals and objectives<br>Hypothesizing their decisions<br>Discussion of research methods   |
| 2. | Planning                          | Identification of information sources<br>Determining how to collect and analyze information<br>Determining how to present the results<br>Establishing procedures and criteria for evaluation of the results and the process<br>The division of tasks (duties) among team members |
| 3. | Research                          | Collection of data<br>The solution of intermediate targets   |
| 4. | Results and / or conclusions      | Data analysis<br>Drawing conclusions   |
| 5. | Evaluation of results and process | Making the final results<br>Summing up, adjustment, final conclusions  |

In preparation for the implementation of the project the students, according to the instructions of the teacher, looked for information on this issue. All available sources were used: articles in newspapers and magazines, Internet. The river runs through the city with a population of over 1 million people and the quality of water in the river, as well as the use of the coastal zone, were the issues of interest of different groups of society many times. On the one hand, it's ecologists and local inhabitants who want to live in an environmentally safe area with lots of green space, with preserved floodplain landscape, and, on the other hand, it is the representatives of business, pursuing the aim of profitable investment for development of the floodplain area of the river. Students were asked to consider all the points of view and arguments to justify the position that they chose. Hypotheses concerning the sources of pollution of the river were put forward. An assumption was made that storm wastewater and sewage hydromechanized work in the riverbed were the main sources of river pollution.

On the second stage, to test the hypothesis, a research plan was created. The sampling site was selected - above the source of contaminated water, at the point of impact and below it. Sample collection frequency and settings that will be explored were also settled.

In the third phase sample collection of aquatic organisms, the measurement of the previously selected parameters were carried out. At this stage, students learn in practice how to take samples, work with devices that perform simple measurements of the physical and chemical parameters, they get used to methods for preservation of samples, sample preparation, species composition of aquatic organisms, their abundance and biomass. At this stage, students learn techniques of practical work, gain new knowledge concerning the morphology of living organisms, their biology, ecology, which significantly extends and complements the knowledge gained in the classroom.

Analysis of the materials and formulation of conclusions stage is one of the most interesting stages for students. At this stage great creative efforts are required from most of them. For the analysis of materials more in-depth study of the subject (than it's required by curriculum) is often needed, but, according to our observations, this fact does not cause any protest of students and knowledge obtained is fixed more firmly. At this stage, it is necessary to develop new, cutting-edge methods used in education and research, development of new computer programs. Work on the project is finished by preparation of the manuscript, making presentations.

The public presentation of the results obtained at conferences and competitions of various levels is separate step. It is a very important stage which does not only teaches to present clearly the data obtained in the course of research, but also to defend the point of view. Besides, participation in conferences and competitions includes elements of competition among students, which contributes to the formation of leadership qualities, striving to achieve the goal, motivates students to continue research activities.

#### 4. Conclusion

Thus, the experience of our use of the project method in the environmental education of schoolchildren shows advantages over traditional forms of education in the form of lessons in the classroom. A multi-component and multi-level nature of ecosystems in the learning process allows students to illustrate various environmental laws in practice, and also to choose the theme of research that could be of real interest for students, taking into account the

age and level of general training, the availability of instrumental and methodological basis for work. This will intensify the educational process and encourage the student to the creative participation in it. The use of project teaching method allowed the students to learn the biology, ecology and other Science disciplines more effectively. In the course of the research students have to learn disciplines related to the environment (chemistry, physics), which allows to strengthen interdisciplinary links and to form a systematic approach for the research, to develop practical skills. Project technique forms the ability to work with the scientific and academic books, teaches to focus on major, essential aspects of the research problem, propose and test hypotheses, to defend his point of view, to offer his views on the issues under investigation. Besides, the project technique teaches to present the results of work, which is very important, as far as the success of the project greatly depends on the skilful presentation. Using the project method allows us to solve educational problems, it helps us to bring up in students psychology of responsibility for the condition of the region environment.

Thus, our experience with the project method shows promise of its application in the system of supplementary education of students in secondary schools. The use of modern educational technology and active learning in environmental education is extremely important, as far as they can be used to provide effective training and professional orientation of students.

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