Technologies of development of the nature study interest through the competence approach to the organization of environmental education

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Abstract—The article summarizes the results of the study on the problem of competence-based approach to the organization of students’ environmental education. The conditions affecting the development of interest in the study of objects of nature are substantiated. The article shows the positive impact of the use of educational and cognitive monitoring practical and project technologies, and research activities on the level of formation of environmental competence of students. The necessary conditions for improving the efficiency of the process of environmental education are identified.

Keywords—ecological education, competence approach, interest to the study of nature, ecological competence, pedagogical technologies

I. INTRODUCTION

Nowadays environmental education is considered as the most important condition for the escape of mankind from the ecological crisis, as a real prerequisite for the escape of civilization to the level of sustainable development. It becomes the fundamental core of the modern education system, the key to the restructuring of society as a whole, the basis of morality and the solution of numerous issues of practical activity of people. In the context of the current environmental situation in many regions of Russia and the world, only an environmentally competent person can understand the scale and consequences of the changes. In this regard, the problem of formation of environmental competence is of particular importance.

V. A. Slastenin believes that "environmental education is not a part of education, but a new meaning and purpose of the modern educational process, a unique means of human preservation and development and the continuation of human civilization." The purpose of environmental education is the formation of a responsible attitude to the environment, which is based on new thinking. This involves the observance of moral and legal principles of environmental management and promotion of optimization ideas, active work on the study and protection of their area, protection and restoration of natural resources [1].

Among the factors hindering the achievement of full educational and educational results of environmental education, S. V. Alekseev notes the misunderstanding of the role of ecology as a science in the formation of the future of all mankind (the use of the phrase “bad ecology”); overstated false information about the level of environmental culture of young people; low level of education of the General population in key areas of sustainable development; insufficient involvement of young people in environmental movements; lack of necessary instrumentation for projects and research by schoolchildren and students [2].

Thus, the problem of research is to identify the organizational and pedagogical conditions and technologies of formation of environmental competence of students.

The object of research in this article is the competence approach in environmental education.

Purpose: to identify, to justify theoretically and experimentally the conditions and technologies to increase interest in the study of nature for the effective formation of environmental competence of students.

As a hypothesis of the study, we suggest that the formation of environmental competence of students and schoolchildren is successfully implemented if:

• Competence-based approach serves as a conceptual basis for training;
• put into practice technologies that increase interest in the study of nature;
• identified and determined the optimal set of conditions that contribute to the formation of environmental competence.

Currently, it is important to create and operate the developing ecological and educational environment of the region to achieve the goals of education for sustainable
development. The introduction of the competence approach required the development of a fundamentally new educational and methodological support, based on modern educational technologies, which should integrate two training systems: the system of knowledge training and the system of thinking training (comparison, analysis, synthesis, creative activity).

II. METHODS

The formation of environmental competence is extremely important, as the integral nature of knowledge of modern ecology, its focus on the satisfaction of human life needs necessitate the inclusion of young people in the solution of environmental problems, regardless of their professional choice.

We have defined the objectives of the study:

• to identify the characteristics and justify the need for the formation of environmental competence of students and schoolchildren;
• to check in practice the conditions and technologies of formation of ecological competence of students.

To solve the problems the following methods were used: methods of theoretical and empirical research, statistical methods.

In the organization of educational and cognitive monitoring important role is played by classes that form practical skills of interaction with nature. It is impossible to master disciplines where the most important laws of natural science are studied; the essence of biological and ecological processes and phenomena is revealed, studying only the theory. Consolidation of knowledge, development of skills to apply them in practice, understanding of biological phenomena, the formation of the ability to analyze, synthesize, to research activities, skills in non-standard situations are carried out in laboratory classes and practices.

Opportunities for joint productive activities provide the organization co-working space on the basis of the Scientific and educational center of the Department of biology and ecology. Form of work co-working (from the English. Co-working, "collaboration") appeared relatively recently, but has established itself on the positive side, since in a broad sense, co-working space is a place where everyone has the opportunity to find a permanent location for work or a collective place for discussion (eng. Co-working space). Students, students, staff and teachers can work here. The equipment of laboratories with special multifunctional equipment helps such joint creative work. The techniques developed by students can be used in working with students during summer environmental camps or joint expeditions.

Educational and cognitive monitoring is an effective technology for the development of interest in natural objects. The subject of monitoring can be varied and depends on the choice of school, but in order to achieve optimal results, it is necessary to fulfill certain conditions: continuity for several years, and on topics that give the environmental movement certainty and continuity; the presence of a unifying leadership structure (environmental center); professional development of teachers and teachers – leaders of this work.

A key part of solving the problem of adequate education as the source link for the development of ecological culture and environmental education and interpretation are students of secondary and senior classes [4,5]. At this level, the basic knowledge of nature is laid, the possibility of advanced training through communication with the University, the development of research skills. High school students can spread their knowledge not only in the family, among friends, but also through social activity.

We conducted a survey of subject teachers, teachers of biology. A total of 82 teachers from 11 districts of the Vologda region were interviewed. There was also a survey of students and teachers (accompanying persons) – participants of the Olympiad in biology and the regional conference "Peace through culture". Participants of the conference and the Olympics are pre-selected, only the best get to the regional stage. Accordingly, a sample of schools in which scientific environmental work is built most successfully is formed. Interviewed all the participants of the school ecological clubs (who wished to answer the questions in the questionnaire), for a total of 32 student and 15 teachers.

III. RESULTS

Experience shows that environmental knowledge of students remains formal if they do not use it in practice.

One example of such activity is "ecological patrolling" - observation and fixing of various problems and forms of pollution in the nature disturbed by the person. This may be, for example, the collection of information (including mapping) of illegal landfills or logging sites in your city, town (locality and beyond). This form of work not only affects the development of environmental competence, but also allows you to discuss the provisions of environmental legislation, as well as contributes to the formation of civic responsibility and patriotism.

Many questions of biology and ecology cannot be studied only in theory, from textbooks, sitting in the classroom. Practice (from Greek. praktikos – active, active) is the link between theoretical learning and future independent activity. In practical terms, monitoring of the state of the banks of water bodies, especially rivers in the run-up to floods, can play an important role. Conducting "environmental patrols" in the spring, before the flood on the rivers due to the practical problem solved in the course of their implementation. This is the identification of places of mass accumulation of garbage on the banks for its rapid cleaning and prevention of flushing into the river during the flood. All information about the dumps pulled out from under the snow is transferred to the municipal authorities, which, taking into account these data, plan a campaign to clean the city.

In the practice of the Vologda State University, patrols were conducted by a group of students who studied the basics of environmental legislation. In addition, before the start of the patrol, an introductory briefing was conducted with its direct participants, including examples of particularly common offenses in the field of water legislation. Student activists surveyed several kilometers of coast within the city. The results of the rounds are documented in detail using maps, signed and submitted to the relevant Department division. Thus, during the implementation of observations the professional competence of students-ecologists is formed and
developed and adequate ecological representations of schoolchildren are formed. This makes it possible to consider environmental patrolling as a component of practical environmental additional education, implemented in a network form with the involvement of practitioners. Patrol participants master (theoretically and in practice) methods of identifying and describing the different types of human impact on natural objects. However, in addition to the formation of these specific skills occurs and the formation of more General skills – observation, the ability to analyze what he saw.

Ecological patrolling is an important addition to the theoretical course of ecology, as even on a relatively small section of the route passing through the city, you can find almost all kinds of anthropogenic impact on nature. Our activists identify a significant number of offenses – up to ten cases per two kilometers of the coast. Among the most common – blocking free access to the coast, illegal discharge of sewage into the river, washing machines on the banks of reservoirs, waste disposal in the water protection zone and clogging of the river bed (including large-sized debris).

Also during the patrol can conduct interviews (surveys) with the local population, which, as practice shows, shows interest and a positive attitude towards eco-action. Thus, not only the civil activity of the population is stimulated and structured, but also the communicative competence of schoolchildren and students are developed in the professional sphere.

Practice-oriented cognitive activity of schoolchildren is organically connected with the process of choosing a future profession, and therefore logically enters the system of career guidance activities of universities and institutions of secondary vocational education. In 2016, the scientific and educational center "Problems of modern natural science" was established at the Vologda State University in order to organize such work. Every year in the framework of career guidance work conducted tours in the laboratory REC for students of schools of the city of Vologda and the region, training sessions on the development of skills and research search, master classes of teachers of the Department, round tables, conferences.

During the survey of students attending preparatory courses at the Department, the tendency of incorrect perception of environmental problems of the region was revealed. The main reason for this we see in the lack of work on environmental education and upbringing of the younger generation. The most popular source of environmental information among students (93%) and schoolchildren (72%) is the media, as the most widely available source of environmental news. It is also noteworthy that, despite the regular use of the World Wide Web, only 18% of students and 25% of schoolchildren mark it as a source of information in the field of ecology. The vast majority of respondents (more than 90%) believe that the improvement of the environmental situation in the country depends on the population. Also, the survey participants associate the improvement of the environmental situation in the country and its regions with the activities of the authorities. Moreover, students and schoolchildren to a greater extent are with the activities of the Federal authorities (49% and 36%, respectively), to a lesser extent are with regional and local authorities (41% and 27%, respectively).

As part of the formation of a network of continuous environmental education specialists of the Department of biology and ecology of the Vologda state University created a scientific and methodological portal "Ecology of the Vologda region" (Ecovol. Russia), which collected a large number of materials on the nature of the Vologda region. These are author's articles, announcements of events, a catalog of unique photos, materials for assignments in the workbook. Teachers of the Department in their work are based on the following principles of the organization of design and research work in the framework of additional education of students: system-activity approach; the use of local history component; sufficient scientific level; availability of topics; demand for the region; motivation to obtain results; practical orientation of research.

The survey showed that 48% of students and 31% of schoolchildren believe that the improvement of the environmental situation is a matter of environmental protection structures and public environmental organizations. Only 30% of schoolchildren and students believe that the solution of environmental problems should be carried out within the framework of international cooperation.

Almost half of the respondents describe the desire for self-education as an integral element of environmental competence. It is also worth noting that about 30% of students and schoolchildren as a component of environmental competence notes environmentally-oriented activities and personal experience with nature, because it is in the process of activity (laboratory and practical classes, excursions, field practices, schools of practical ecology, etc.) students receive invaluable experience in solving environmental problems.

Respondents assess their own level of environmental competence quite highly. So 95% of graduates, 49% of students call the level of their environmental competence high. About 60% of schoolchildren and the other half of students consider their level of competence to be average. And only about 10% of schoolchildren and students believe that they are at a low level.

Assessment of the worldview level showed that students during the years of training aesthetic setting decreased from 38% to 28%. On the contrary, cognitive increased from 46% to 56%, which is natural, as the curriculum of this specialty aimed students at independent search of environmental information, provides all opportunities for the development of cognitive interest and the formation of environmentally-oriented activities. This is confirmed by an increase in the ethical component from 0% to 6% and a decrease in the pragmatic component from 6% to 0%.

The high level of environmental education in the region is evidenced by the fact that the questionnaire "is your school working on environmental education and education of students?"100% of teachers responded positively. More than a third of respondents noted that schoolchildren take part in various environmental actions. We agree with N.S. Kartasheva, who notes that the implementation of the principle of ecological equivalence underlying the formation of ecological culture of personality can be accomplished through creative activities, and aims, including the
restoration of the ecological functions of ecosystems [6]. This work is carried out in the form of both national and even international actions, and school extracurricular activities. The leadership of this form of work, which was traditional for the Soviet education system, is due to the relative simplicity of its organization. The tradition of “Saturdays” in Russia has a rich history, currently local authorities take part in their organization, which, on the one hand, facilitates the work of teachers, and on the other is an additional incentive. In second place in popularity are research projects of schoolchildren – they as a form of environmental work was noted by 30 % of respondents.

Another common form of environmental work with students is the so-called ecology week. Subject week of ecology is an opportunity for environmental education of students through a series of deliberate activities that contribute to the deepening and expansion of knowledge of biological laws, of the interrelationship of all living and inanimate nature. Subject week is an active form of organization of educational activities of students. It promotes the stimulation of cognitive and mental processes of students, reveals their interest in the subject, gives the opportunity to express them. The teacher in the organization of events of the subject week can realize their creative potential, which contributes to the improvement of relationships, and, consequently, the quality of the educational result [7, 8].

In a smaller number of schools, such forms of work as an environmental circle or a summer environmental camp are carried out (22% of respondents noted). These types of work are traditional for educational institutions of the region. The Department of natural resources is also involved in the organization of summer camps. Other forms of environmental education and training are much less popular. I would especially like to note the low percentage of schools in which school scientific societies (SSS) are organized. This means that, in carrying out projects, students are deprived of the opportunity to discuss their results on extra-curricular (inter-parallel) platforms.

The answer to the question about the forms of work in effective schools demonstrates the predominance of the organization in the form of SSS. Thus, out of the small number of schools in which school societies of students operate (less than 5 per cent), a significant number are winners of municipal stages of scientific competitions, which undoubtedly indicates the effectiveness of this form of work. The individual form of research on ecology is also effective.

The importance and problem-solving for the school of research activity of students emphasizes the fact that the question "Do You need an advice? If so, what help do You need?" most of the respondents responded positively. The analysis of the open part of the answer allowed establishing that in all cases the Advisory assistance, one way or another, concerned the organization of research activities of students.

Also, the need of teachers in the formation of a single methodological space can be analyzed, based on the answers to the question "Do You want to get more information about the activities carried out in the area of environmental education?" 92% of respondents answered positively to this question. The sincerity of the answers to this question confirms the fact that 100 % of those who answered it positively indicated their contacts for feedback and for information.

In addition, attention is drawn to the fact that 75% of successful schools are involved in the system of inter-school interactions, and the presence of certain links with other educational institutions of different levels was noted by 100 % of respondents representing schools participating in the regional scientific conference. We also emphasize the importance of libraries for the development of environmental education, with which 75 % of "successful" schools cooperate in one form or another. 50 % of respondents noted cooperation with institutions of additional education; the share of universities is slightly less and is 38 %.

At the same time, despite the high degree of involvement of successful schools in the system of ecological environment of the region, the intensity of interaction remains low, as indicated by two-thirds of respondents.

This is also evidenced by a survey of students participating in the regional conference. To the question "Do you attend other institutions in the framework of research at the University?" almost half (42%) of respondents answered "I do not visit". The library indicated a much smaller number of students than teachers – 42 % against 75 %.

Thus, even well-established (according to the teacher) work on cooperation does not always bring results. The effectiveness of even the most successful schools can be estimated as 30-50 % (from the ratio of responses of teachers and students).

Analysis of the work of effective schools shows that involvement in the continuous educational process is a mandatory attribute of success. At the same time, the low intensity and effectiveness of cooperation suggest the existence of unrealized potential for the integration of schools in the environmental education space. An important role in this can be played by the University as a system-forming center.

The methodological basis for the formation of environmental competence is the research approach in the works and projects close to the content of the subject of biology. In order to carry out joint expeditions of professionals – researchers of the Department of biology and ecology of the University and beginning research work of schoolchildren; their training is carried out, including several forms of work.

Interactive interaction is implemented in such forms of work as master classes. They may be devoted to hydro biological research methods or to the determination of surface water quality. Master classes include both theoretical and practical components. Subjects of theoretical lectures can be devoted to the history of the study of water quality of reservoirs and their inhabitants; characteristics of the main directions and types of hydrological, hydro chemical and hydro biological studies, etc. For interactive lectures Internet resources, publications and scientific and methodical literature, stock and handouts, photos, video clips are used.

In the practical part of the master class students have the opportunity to work on different equipment, for example, to get acquainted with the device of a binocular microscope, to observe the amazing world of microorganisms.
Interactive workshop with a demonstration of devices for selection of hydro-biological samples is held in laboratories.

Familiarity with the methods and algorithms of field research also includes the determination of water quality. Directly on the pond (for example, during an expedition on the Sukhna river) students determine the transparency, temperature, pH of the water. Then collect water samples for hydro chemical analysis and collect hydro biological material: samples of phytoplankton, zooplankton, zoobenthos. During the expedition young researchers actively participated in the collection of field data (samples of phytoplankton by the sampler, zooplankton by the Jedi net, zoobenthos by the grab) and water samples for subsequent geochemical analysis; conducted measurement (determination of the depth, speed of currents at selected stations observations of water temperature and transparency using the Secchi disk).

To study the problems of environmental pollution, a mercury analyzer is actively used, where young researchers, together with University staff, can analyze the biological material for the content of this heavy metal.

IV. DISCUSSION

In the process of research, we have identified the conditions and pedagogical technologies that can increase interest in the study of objects of nature and form the environmental competence of students and schoolchildren.

The effectiveness of the implemented conditions can be illustrated on the basis of the following parameters: motivation for environmentally oriented activities, the level of environmental culture, academic performance, quality of knowledge, the type of dominant attitude towards nature, the sustainability of interest in environmental problems, the level of development of subjective attitude to nature, self-assessment of the level of environmental competence.

The analysis of the work on the implementation of a set of conditions for the formation of environmental competence shows the positive dynamics of all monitored parameters. Studies have shown a sufficient level of environmental competence of senior students, which has increased significantly during their studies at the University. Students who are systematically engaged in design and research work of a practical nature, there is a tendency to develop interest in natural objects and increase the level of formation of environmental competence. Based on the analysis of the data obtained, we can conclude about the levels of formation of environmental competence: senior students have a level close to ideal. Students of junior courses and school students have sufficient level.

The article reveals the potential of practical activities for the formation of a high level of environmental culture of students and anthropocentric type of consciousness as the main components of the "strategy of sustainable education".

The data obtained as a result of surveys and questionnaires of students of specialty, bachelor's degree, as well as graduates and environmental-oriented students are summarized.

The research materials can be used to improve practical training in the field of environmental education.

REFERENCES