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# Methodology for preparing biology students for environmental and local study activities

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**Abstract**

The current situation in education is characterized by an increased role for the environmental dimension. The purpose of our research is to develop an experimental verification and an effective methodology for shaping the readiness of students of biology, for environmental and local study activities. The research involved theoretical and experimental teaching methods. The participants for the experiment consisted of 105 students in the experimental group and 98 students in the control group. As a result of experimental training, it turned out that we developed a model of the methodology for the formation of environmental and local study activities in the training of biologist students, in the system of advanced training of biologist specialists. The article has scientific interest to teachers and researchers of pedagogical universities who want to ensure an effective educational process.

**Keywords**: Biologist; environment; Kazakhstan; regional component; specialist, teacher.

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## 1. Introduction

The current situation in education is characterized by an increased role for the environmental dimension (Whittle, Tiwari, Yan & Williams, 2020). The ecological literacy of the population is currently determined at a qualitative level by understanding the close connection between human activities and the environment. The importance of environmental education is not questioned today, it should cover all ages and social groups.

The greening of education at all levels is due to the aggravation of several environmental problems, which are overdue not only the need to change technologies in production to protect and protect the environment but also to form new, nature-aligned thinking (Liu, Zhu, Li, Meng & Song, 2020). It is this thinking that will enable a person to cope with his increasing needs and preserve nature in the form that is necessary for its continued existence, including the existence of a person.

Thus, society needs environmentally educated citizens who can behave following natural laws, as well as specially trained environmental specialists (Hadjichambis & Paraskeva-Hadjichambi, 2020). It is such specialists who will know exactly how to overcome the overdue crisis and get out of it with the least losses. To date, educational institutions do not meet the needs of society in the training of environmental specialists. In the school's basic curriculum, the subject "Ecology" is absent, its implementation is carried out at the expense of the regional component. Environmental education is carried out mainly on the initiative of individual teachers, and school administrators, sometimes with the support of the city or regional departments of education.

The urgent need to strengthen the environmental and local study aspect in the training of students of biologists at a pedagogical university is indicated in the writings of many scientists who were the basis of our research; The methodological basis of training of environmentally competent specialists (Zakhlebny, Zverev & Suravegina, 1977); in Kazakhstan (Beisenova, & Shildebaev, 2000). The theoretical basis of the study was the theory of cognition; provisions of the psychological and pedagogical theory of educational and cognitive activity ; theory of vocational education .

However, despite such an active scientific development of the problem of interest to us, one cannot judge the implementation of a systematic approach to its solution, since only certain aspects of the problem of forming the readiness of future teachers of biologists for environmental and local study are covered. All this negatively affects the effectiveness of the educational process and proves the need to create a methodology for organizing the formation of the readiness of future teachers of biologists for environmental and local study activities.

### *1.1. Theoretical background*

It should be noted that in many universities of any direction, including pedagogical, there are environmental courses, but they do not always fully take advantage of the opportunities for greening education. The curricula of natural science faculties of universities are especially saturated with such disciplines, in some cases, specialized departments are opened to train specialists - ecologists, and ecologists-teachers (Abai Kazakh National Pedagogical University).

At the same time, environmental education in higher education requires not separate classes and environmental measures, but a holistic teaching system that involves a more complete and concrete study of the environment in the first place of its region. The local study approach in the study of ecology allows not only to obtain specific information about the nature of its region but also to form a personally significant attitude to its nature and to nature as a whole, as well as the ability to conduct research work (Childebaev, Usenova & Baikeeva, 2017).

Currently, a contradiction is revealed between the needs of society in the development of environmental education and the existing practice of training teachers in biology, geography, chemistry, and others. Today, serious attention should be paid to environmental training and retraining of teachers for all levels of education and; the creation of a holistic interdisciplinary

education system in the field of ecology, nature management, environmental protection, and life safety.

By the decision of UNESCO, the last 20 years of the past century have been declared years of environmental education. The intensive development of environmental education is becoming an urgent task for all countries and is considered one of the means to overcome the global environmental crisis. School is central to environmental education for the general public. However, the quality and performance of environmental education are not satisfactory. The state of environmental education of schoolchildren is determined by several objective and subjective reasons, among which the acute shortage of qualified pedagogical personnel is dominant.

The lack of training of teachers in environmental education at school is observed in ours and other countries. Thus, the problem of increasing the teacher's professional suitability for environmental education of schoolchildren is a problem of global, equally relevant for all countries. The main reason for the insufficiently effective solution to this problem, in our opinion, is the poor development of the theory and practice of university environmental education. Currently, there is a discrepancy in the solution of issues of this education in school and university pedagogy.

Environmental training of a biology teacher is a necessity, a social order of society, due to the greening of the entire educational field of knowledge, science, and production. A large role in the professional and environmental training of future teachers of biology belongs to local study and the entire system of local study training. Within the framework of local study training and local study, from the point of view of the ecological imperative, a special environmental and local study direction has taken shape, the essence of which is to contribute to the formation of ecological culture and personal responsibility for preserving the quality of the environment.

The essence of the local study principle is now seen in the conscious assimilation of environmental and local study knowledge about its region, based on which the need for creative and emotional-value activities is developed to preserve and optimize the environmental situation in its area. Greening the educational process at a pedagogical university opens up wide possibilities for using local study not only as a methodological but also as a scientific and practical ecological local study in their close relationship. In turn, in solving the problems of environmental education, the implementation of the local study principle is of great importance, since a deep understanding of the causes and essence of the modern environmental crisis is possible only when we meet and study the ecological state of the immediate environment.

In the scientific literature, aspects of environmental education on the one hand and the local study principle (approach) on the other are quite fully covered, but in our opinion, the content of environmental and local study activities combining environmental education issues with local study material remains insufficiently disclosed. For the full implementation of environmental and local study activities at the school, biology students need to strengthen environmental and local study aspects in theoretical and practical training, which will ensure the formation of a value attitude to nature, the development of the skills of conducting research work in nature specifically of their region, as well as the skills of conducting environmental and local study work with schoolchildren and the skills of organizing the pedagogical process. This need determined the relevance of our study and determined the choice of the topic: "Formation of the readiness of students-biologists for environmental and local study activities at school."

To date, there are many studies in pedagogical science, the results of which can be used as a scientific and theoretical basis to solve the problem of preparing future teachers for professional and pedagogical activities, in particular, for environmental and local study. These are general theoretical works on the professional training of teachers, which substantiate the goals, objectives, content, and structure of higher pedagogical education, analyze the system of pedagogical training of future teachers for professional and pedagogical activities; development of scientific and methodological

foundations of environmental education in higher education (Leal Filho et al., 2018; Ardoin, Bowers & Gaillard, 2020).

Based on all the above, the main goal of the environmental and local study activities of students of biologists is specified, which consists in developing the student's personality, mastering the skills of local study activities, as a universal way of knowing reality in the educational process, developing communication skills and activating life position. Experience in the formation of environmental and local history activities in the conditions of training students of biologists is formed gradually.

### *1.2. Purpose of study*

Analysis of scientific and methodological literature showed that despite the available research on various aspects of the formation of environmental and local study, the training of future teachers of biologists was not the subject of special consideration. In this regard, modern education should be built following the direction and strategic development of the model of innovative development and with the requirements of competitiveness of the leading countries of the world. This requires the training of a teacher who can adapt quickly to daily changes, prepared for independent creative activity.

## 2. Materials and Methods

### *2.1. Data collection instruments*

The research involved theoretical and experimental teaching methods. The theoretical method involved analysis, synthesis, comparison, and generalization, modeling. The experiment included direct and indirect pedagogical observation, pedagogical experiment, conversation, interviewing, questionnaire, and conducting control sections.

### *2.2. Participants*

Experimental work was carried out based on the Abai Kazakh National Pedagogical University. At the beginning of the experiment, two groups of students were formed: experimental (EC) and control (CC) groups. The groups did not differ in the level of training and studied disciplines according to the program. The difference was that the students of the experimental groups were trained according to the proposed methodology. The participants for the experiment consisted of 105 students in the experimental group and 98 students in the control group.

### *2.3. Analysis*

The research used statistical methods of mathematical analysis of experimental data.

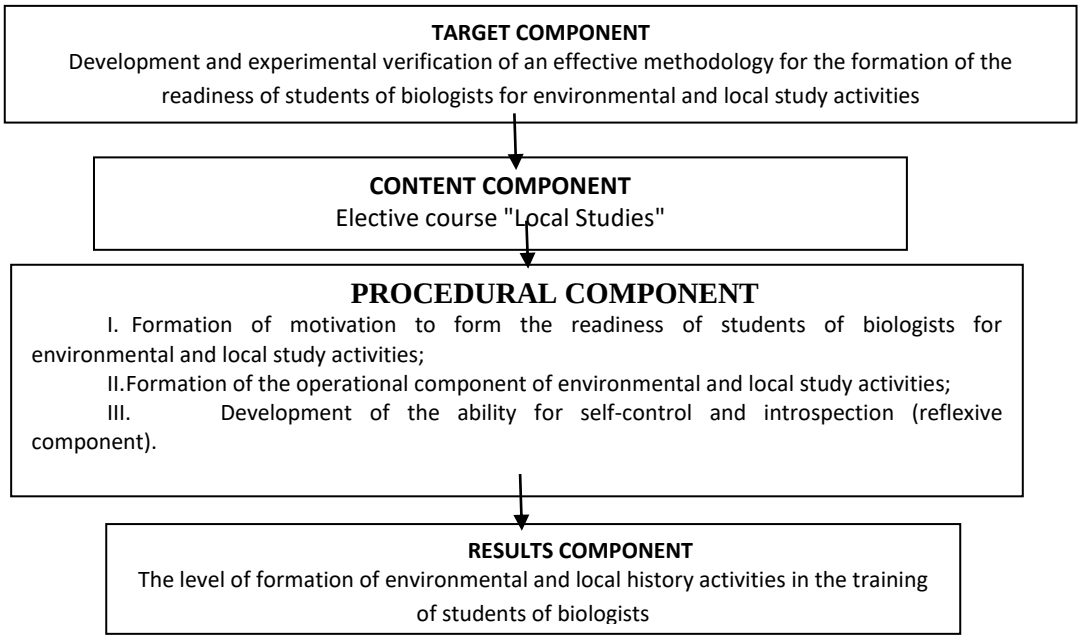
### *2.4. Procedure*

In the first stage, psychological, pedagogical, philosophical, historical, and methodological literature on the problem of research was studied; analysis of curricula of the specialty "Biology" of Abai Kazakh National Pedagogical University; the content of the main components of the biology teacher's readiness for the implementation of environmental and local study activities at school has been determined. To clarify the state of the problem under study, an ascertaining experiment was conducted, the results of which made it possible to determine the program of the forming experiment.

At the second stage of the study, a formative experiment was developed, during which a model of environmental and local history training for students of biologists was developed and implemented; an elective course "Local Studies" was developed and tested. The experiment was conducted to form in students of biologists all components of readiness for environmental and local study activities at school. The third stage (2001-2003) included systematization, processing, and analysis of the results of the forming experiment, verification of individual positions, and design of the research results (Figure 1).

**Figure 1**

*Model of methodology for the formation of readiness of students of biologists for environmental and local study activities*




The formation of environmental and local history skills among students of biologists can be carried out only within the framework of a specially developed system, the features of which are: the integration of methodological, theoretical, methodological, and practical types of training for the future specialist; the active nature of training, which is reflected in the system of environmental and local study professional and pedagogical tasks. The integrity of the developed system is achieved by harmonizing the developed system with structural (purpose, content, organizational forms, and methods) and functional (gnostic, design, organizational, diagnostic) components. The system is formed by tasks focused on environmental and local study activities. This system is based on the principles of integrity, level, dynamism, and complexity of the formation of environmental and local study skills as a special group.

## 3. Results

The purpose of the experimental study was to clarify and verify the effectiveness of the developed methodology for forming the readiness of student of biologists for environmental and local study activities. When planning and conducting the experiment, we relied on the experience gained by foreign and domestic pedagogy, which is reflected in many works, and used methods of pedagogical diagnostics and mathematical processing.

Following the purpose of the experimental research, we gradually solved the following tasks:

1) study of the state of the problem of preparing students of biologists for environmental and local study activities;

2) study the readiness of students for environmental and local study activities;

3) develop and test models of the methodological system for organizing the development of the readiness of students of biologists for environmental and local study activities;

4) assess the effectiveness of the developed methodological model.

Based on the selected criteria, we distinguish three levels of formation among students of environmental and local study.

*Low level*: Students show a certain interest in environmental and local study activities and their results. Students are passive in learning.

*Average level*: Students understand the necessity and importance of forming the readiness of students of biologists for environmental and local history activities, they are quite active in teaching, but direct insufficient efforts to master the missing knowledge on the theory of environmental and local study activities. Students have theoretical knowledge about environmental and local studies, but this knowledge is not sufficiently complete and systematized.

*High level*: Students show a steady interest in environmental and local studies. Understanding the necessity and importance of environmental and local history activities in educational activities, as well as in future professional activities, students carry out it consciously, without motivation from the outside.

**Table 1**

*Formation of research skills in students at the beginning of the experiment (%)*

| Levels of formation of research skills | Indicators of the formation of research skills by groups | | | |
|---|---|---|---|---|
| | Experimental groups | | Control groups | |
| | Number of persons | (%) | Number of persons | (%) |
| Low | 63 | 59,9 | 63 | 64,2 |
| Average | 42 | 39,9 | 35 | 35,7 |
| High | 0 | 0,0 | 0 | 0,0 |

**Table 2**

*Formation of research skills in students at the end of the experiment*

| Levels of formation of research skills | Indicators of the formation of research skills by groups | | | |
|---|---|---|---|---|
| | Experimental groups | | Control groups | |
| | Number of persons | (%) | Number of persons | (%) |
| Low | 14 | 13,3 | 28 | 28,5 |
| Average | 63 | 59,9 | 63 | 64,3 |
| High | 28 | 26,7 | 7 | 7,1 |

Comparing the data on the formation of environmental and local study activities obtained from these two sections, we found that in the experimental group the number of students with a high level of formation of the studied skills increased by 26.7%, and in the control group - only by 7.1%. The number of students remaining at the low level of formation of the studied skills in the experimental group decreased by 46.6%, and in the control group - it only by 35.7%. The results of the study among 2nd-year students, the formation of environmental and local study activities increased by 17.4%, and in the control group - only by 4.1%. The number of students remaining at the low level of formation of environmental and local study activities in the experimental group decreased by 17.4%, and in the control group - by only 8.3%.

## 4. Discussion

At the expense of students who moved from a low level of formation of environmental and local study activities to an average level, the number of students at the average level was 39.1%. As a result of experimental training, it turned out that we developed a model of the methodology for the formation of environmental and local study activities in the training of biologist students, in the system of advanced training of biologist specialists.

The goal of preparing students of biologists is to train future specialists with a wide range of professional and pedagogical competencies, systematize knowledge in biology, and capable of personal and professional development throughout life (Byshevets et al., 2019; Orishev &

Burkhonov, 2021). This becomes possible due to the development of students' ability to motivate actions, independently navigate the information received, form creative thinking, and use the latest achievements of science and practice.

The dynamics of the development of environmental and local studies were traced by us throughout the experiment. This was necessary to carry out analysis and effectively manage the activities of students participating in the experiment, as well as to exclude the possibility of obtaining random results of the experiment. The results of experimental training indicate that the developed model of the methodology for the development of research activities in the training of students of biologists is effective and can be applied to the content of the disciplines "Invertebrate Zoology" and "Vertebrate Zoology" in pedagogical universities, in the system of advanced training of biologists (Romaniuk et al., 2021). Thus, the logical set of solutions to the tasks set proved the validity of the theoretical positions put forward during the research.

## 5. Conclusions

Using systematic, active, competent, and personal-oriented approaches, a model of the methodological system for organizing the development of research activities was designed for the training of future biologists, including target, motivational, content, procedural, and resultant components. Based on the model of the methodological system, an experimental methodology for the development of research activities in the training of future biologists is implemented, which is a means of increasing the effectiveness of the learning process in the content of the discipline "Invertebrate Zoology" and "Vertebrate Zoology" and the development of research activities.

A comparative analysis of the development of research activities in the training of future biologists and the increased motivation of the educational activities of students of control and experimental groups proved the effectiveness of the proposed methodology and methodological approaches defined in the research. The article has scientific interest to teachers and researchers of pedagogical universities who want to ensure an effective educational process.

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