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PEDAGOGICAL CONDITIONS FOR THE FORMATION OF GEOGRAPHY TEACHERS GEOECOLOGICAL COMPETENCE IN THE EDUCATIONAL PROCESS

Abstract: Today, the formation of competence of geography teachers is an actual task of higher education. To prepare a competitive personality capable of perceiving global problems, to functioning in new socio-economic, socio-cultural conditions, taking into account the modern concept of the joint existence of man and nature. Competence is the ability and knowledge in the field of interaction between geosystems and ecosystems, the influence of human activity on the surrounding nature, as well as the ability to adapt to changing environmental conditions and effectively respond to environmental threats and challenges.

The article has an analysis of theoretical and methodological literature, the following concepts are specified and given to the following concepts: “competence”, “competency-based approach”. The pedagogical conditions for the effective formation of the competence of geography teachers in the educational process have been identified and substantiated, and the pedagogical technology for the formation of geography teachers’ competence in the educational process of the university (through the disciplines of the professional cycle, educational and scientific research activity) has been identified.

Key words: competence, competence-based learning approach, geoecological skills, didactics, pedagogical condition.

Introduction

In the context of the education reform being carried out in the Republic of Kazakhstan, the professional training of future teachers, who will have to work in the conditions of a new educational paradigm and ensure the quality of education that meets modern requirements, is of particular importance today.

A new education system is being formed, which is focused on modern trends in the world educational space. This process entails significant changes in pedagogical science and the content of the educational process. These conditions oblige the modern teacher to be competent in a wide range of modern innovative approaches to modeling new generation educational materials (PRK, 2019). Currently, the global level of training is confirmed by the effectiveness of learning, since it contributes to the student’s knowledge, business skills, independent research, strengthening motivation for the study and development of personal qualities (Kudaibergenova, 2013).

And today, more than ever, the question of culture as an integral part of the general human culture is relevant. The main role in the formation of consciousness is behind education.

The system of pedagogical education is faced with the task of preparing a competitive individual who is capable of perceiving global problems, of functioning in new socio-economic, socio-cultural conditions, taking into account the modern idea of the coexistence of man and nature, which leads beyond the limits of narrow professional subject competence, generates the need for the formation of a new professional competence of a specialist in the field of education - geoecological competence (Bakirova&Seilkhan, 2014). In this context, it becomes necessary to single out competence as a component of professional competence.

Despite the existence of research on environmental education, there is a lack of systematic approaches to the formation of geoecological competence specifically for geography teachers. The problem is the lack of methodological models that would include the combination of geographical and environmental knowledge in teaching practice. Based on the above, the formulation of the problem of this study is to determine the pedagogical conditions that promote the formation of geo-ecological competence in the educational process. Taking into account the stated problem, the aim of the study was formulated - to determine the optimal pedagogical conditions for the formation of competence of geography teachers in the teaching process. The objectives of the study are: to reveal the theoretical foundations of the competence approach in the preparation of teachers of geography; to specify the essence of competence; to determine the pedagogical conditions of effective formation of competence of teachers of geography in the educational process.

The object of the research is the process of formation of geography teachers' competence on the basis of a higher educational institution. Subject of research: pedagogical conditions for the formation of geography teachers' competence.

Research methods and organization

In the process of research, a method of systematic literary analysis of theoretical and practical material, as well as content analysis of publications on the Internet and other media was used.

The method of pedagogical experiment was also applied. Experimental work was organized on the basis of Zhetysu University named after I. Zhansugurov in Taldykkorgan city on the educational program "Geography".

The work was organized in several stages:

- analyzed the profile disciplines of the modular educational program Geography;
- identified sections and themes of the relevant disciplines for the development of the competence of students;
- a thematic separation of the content of didactic material was carried out in accordance with the type of competencies formed;
- changes in their content were made within permissible limits;
- interdisciplinary relations were determined;
- methodological developments of special classes with a orientation were carried out;
- text tasks and methods for assessing the degree of effectiveness of the educational process were prepared.

In the process of research, the main levels of the formation of the geoecological competence of students were determined: very low, low, average, high. Formation indicators are: cognitive, motivational-value, active-practical components. The experiment was conducted in two stages: stating and forming. The study involved 58 students of 3-4 courses of the educational programme 'Geography', where 28 students constituted the control group and 30 students were included in the experimental group. Each group included participants with low and high level of knowledge according to the results of pre-testing to ensure uniformity and objectivity of the results.

The scale of the formation of geoecological competence were applied as pre-test and post-test in order to examine the changes in students' geoecological skills. The pre-test and post-test were conducted on stating and forming stages. Instruments for indicators of identifying the level of geoecological competencies are Understanding the Problem, Describing the Problem, Planning the Solution, Using the Solution, Evaluate the Solution. Test consists of 40 multiple-choice questions. For each question answered correctly 1 point and for each question answered incorrectly 0 point were given. The maximum score for the test is 40 and the minimum score is 0.

As part of the study, 8 training sessions were conducted, 3 hours a week for 8 weeks were carried out. Each lesson began with a problem containing a geoecological orientation. During classes, students participate in such processes as determining the problem, collecting the necessary information to solve it, determining the hypothesis and developing ways to solve the problem.

Literature review

Competence is understood as a characteristic of a person, which, in content and structurally and functionally, is interconnected with the worldview, consciousness, thinking, behavior, ecological culture.

The problem of the competence of the personality and its development is the subject of a number of psychological and pedagogical studies. The formation of the competence of the future teacher of geography is based on the competence-based learning approach (Makoedova, 2007).

The problem of modernization of professional education based on competence-based learning approach is considered in the works of Khutorskoy (2013), Zeer (2002).

Thus, B.T.Kenzhebekov, F.Mizambaeva turn much attention to the formation of key competencies of the future specialist, necessary for the successful self-realization of the individual in professional activity (Kenzhebekov, 2001; Mizambaeva, 2019).

Reynolds & Salters (1995) point out that the formation of competencies as the basis for teaching and training teachers is a natural process. They distinguish three types of competencies depending on:

- professional orientation;
- the ability to be creative and flexible;
- acquired knowledge and their understanding.

Each type is considered in accordance with the acquired knowledge and their understanding, methods and forms of training. It is the competence-based learning approach in professional training that contributes to the formation of the necessary competencies of future teachers (Reynolds& Salters, 1995).

Separate works are devoted to the formation of environmental competence of students in the process of natural science directions in the system of higher (Makoedova, 2007), general (Kazakova, 2004) and additional (Ermakov, 2008) education.

Environmental competence is understood by Ermakov (2008) as "conscious and meaningful acquisition of theoretical knowledge, skills, ways of making decisions, moral standards, values and traditions in the process of natural protection, which has personal and social significance, and the experience of solving environmental problems on this basis".

According to Gagarin (2011) environmental competence as an integrative property of the personality includes knowledge about the environment, ideas about the nature and norms of human interaction with the environment, ideas about nature as the most important value, readiness and ability to solve environmental problems, experience in practical activities to preserve and improve the environment, environmentally significant personal qualities (human character, empathy, frugality and "environmental" responsibility for the consequences of their activities).

The research touches on the psychological and pedagogical features of environmental competence as an element of the professionalism of future teachers, etc. At the same time, the essential and functional content of the concept of "environmental competence", as well as the features of formation and development, are presented by various authors in different aspects (Alekseeva, 2021).

Geoecological competence is defined as the ability of geography teachers to effectively integrate environmental knowledge into the educational process using interdisciplinary approaches. This implies in-depth knowledge of the interaction of natural and anthropogenic systems, skills in environmental risk assessment, and an understanding of sustainable development (Kurolap& Fedotov, 2018).

An important aspect of developing geoecological competence is the creation of favourable pedagogical conditions that provide an optimal learning environment for students and teachers.

Research shows that interdisciplinary links between geography and other sciences such as biology, chemistry and ecology contribute to the development of geoecological competence. Incorporating projects that bring together different disciplines into the curriculum helps geography teachers to teach environmental topics more effectively (Shchitova et al., 2020).

Modern technology plays an important role in building environmental literacy. The use of digital tools such as geographic information systems, climate change models, and online collaborative learning platforms can strengthen the practical orientation of learning and provide skills in working with environmental data (Istomina, 2024).

Results and discussion

The geoecological competence of the future geography teacher includes:

- the cognitive component - the formation of a system of geoecological knowledge (natural science, worldview, regulatory, practical), ways of thinking, acting as an indicative basis for geoecological activity.

- motivational-value component - the formation of value orientations, understanding of the meanings of environmental activity that determine the awareness of the need to preserve the natural environment as the most important value; readiness for active participation in geoecological activities, environmental measures.

- practically the activity component - the ability to practically apply geoecological knowledge when identifying, solving and preventing geoecological problems, improving the state.

The study of the curriculum and program of geographical education made it possible to see the possibilities of forming geocological competence in teaching training courses of a profile cycle such as “General Earth”, “General Geology”, “General Physical Geography of the World”, “Landscape Studies”, “Physical Geography of Kazakhstan”, “Soils Geography”, “Cartography with the basics of topography”, “Methods of field and distance studies”, “Methods of using digital cartographic resources”, “Meteorology with the basics of climatology”, “General hydrology”, “Methods of geoinformation technologies”, “Geotechnological foundations for modeling geosystems”, “Biogeography”, “Local history”, “Sacred geography of Kazakhstan” “Technology of remote sensing of the Earth”, “Fundamentals of Geodesy”, “Geoecology with the basics of environmental management”.

The main task, in connection with the goal, was in the restructuring of the content of various courses in order to strengthen their geoecological orientation in their content, which has a direct access to the formation of geoecological competence.

An analysis of psychological and pedagogical literature on this issue made it possible to conclude that competence is understood as a designation of the educational result of the student for real possession of methods, means of activity, the possession of skills that allow us to achieve the goal. In turn, geoecological competence is an integrative personality quality, involving the use of the acquired environmental and geographical knowledge, skills in a certain situation to solve any problem used in the everyday practical activities of the individual.

Analysis of the content of academic disciplines of theoretical profile showed the availability of topics and issues for the formation of geoecological competence. These topics

include the principles of the integrated characteristics of natural territorial complexes, features of the interaction of man and nature in various physical and geographical regions, the influence of natural factors on resettlement, methods of farming, culture, life and health of people, human ecology and its ratio with geographical sciences, organic. The world, natural resources, the provision of water resources of different regions, land resources and their use, biological resources, a special role in forest resources, measures for the protection and restoration of forests, the most important environmental problems: depletion of resources, air pollution and water supply of balance in natural territorial complexes, other negative consequences of the use of natural resources, the features of these problems and ways to solve them, the degree of change in the nature of different regions in connection with the action of natural and socio-economic factors, cultural landscapes, protection and rational nature use in different the countries of the region, anthropogenic changes in natural complexes, the stability of geosystems, natural-anthropogenic complexes, problems of technogenic pollution, regional and local geographical forecasts, environmental and geographical examinations, information support of various geoecological programs.

The listed topics focus on the problems of practice-oriented geoecological activity, but are insufficient for the formation of geoecological competence of future teachers of geography.

In this regard, we carried out modeling their content within the permissible limits of the variable part, taking into account the regulation of the list of professional geoecological skills related to the solution of a specific geoecological problem arising from the context of the learning topic.

In the course of which they are revealed:

1. Chain reactions in the components of natural and household complexes and between them caused by vertical and horizontal bonds;

2. Differences in the stability of natural, economic complexes to the same influences;

3. Total combinations of various types of influences, changes, consequences in one territory; various temporary intervals in the reaction of nature, economy, population to influence;

4. Qualitative and quantitative connections between influences, changes, consequences of influences.

Interdisciplinary connections were established and special training situations were created on their basis using integrative complex tasks.

For example, according to the course “Geoecology with the basics of environmental management” the module “The influence of human economic activity on environmental pollution” is modeled with the possibility of using the measurements of the portable automatic gas analyzer GANG-4, observations of the distance probing, GIS-technology, the digital professional weather station “Bars”, digital platforms such as Ventusky.com, Meteoblue.com, Airkz mobile applications and others. It gives the opportunity to clearly evaluate the environment of human economic activity for environmental pollution, calculate the spread of chemical or radioactive pollution. By means of them, you can automatically calculate the areas of the injured areas, evaluate the volume of chemical and radioactive precipitation, allocate settlements and other objects located within the dangerous territory. The use of geoinformation systems (GIS) allows you to quickly receive information on request and display it on a cartoon, evaluate the condition of the ecosystem and predict its development. Using GIS, it is convenient to simulate the influence and spread of pollution from point and inaccurate (spatial) sources on the ground, in the atmosphere and on the hydrological network (Istomina, 2024).

The results of model calculations can be applied to natural cards, such as vegetation cards, or on cards of residential arrays in this area. As a result, you can quickly assess the immediate and future consequences of such extreme situations as a spill of oil and other harmful substances, as well as the influence of permanent spot and areas pollutants.

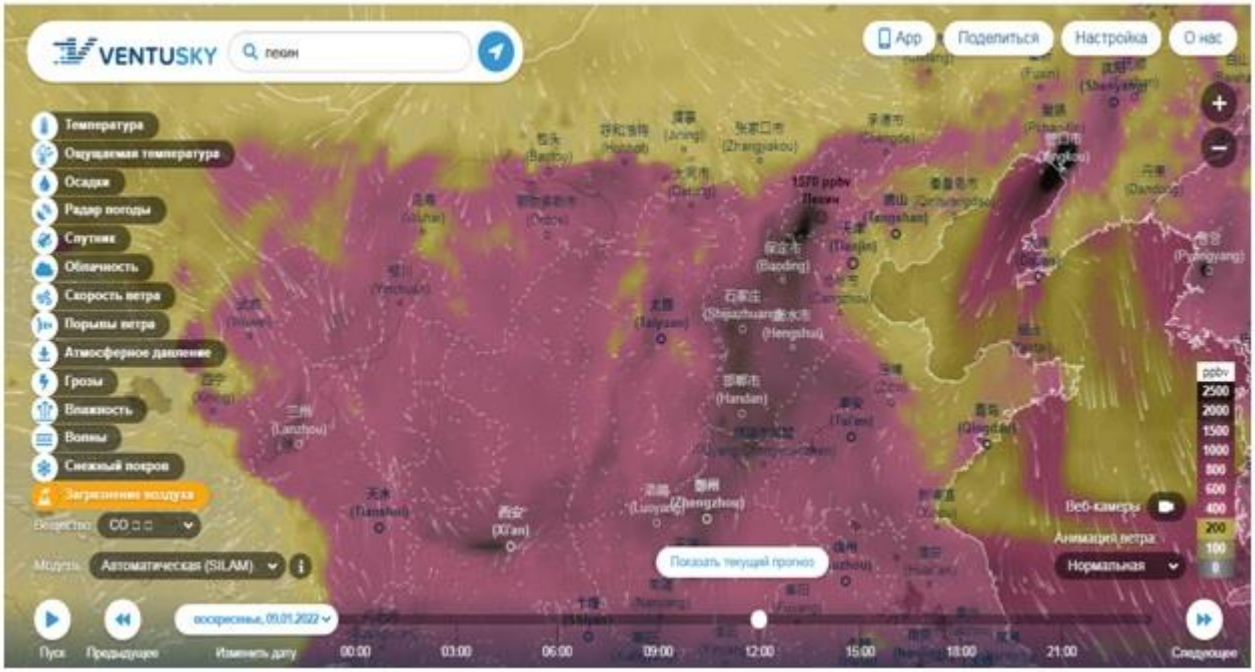
The use of Excel as a database gives significant advantages, it can read a wide range of data formats, provides basic data service functions (Gürbüz & Karadeniz, 2020), data management and analysis of GIS data (including access to input data, storage of intermediate and output data, positions for writing reports, diagrams, Pictures and other analytical representations of data).

Thanks to these components, students, working in a team, integrating the knowledge of chemistry, ecology, computer science, cartography, can identify the content of pollutant harmful substances, the causes of their formation and the main sources of pollution, as well as graphically process, analyze and evaluate the quantitative data obtained under determining the main sources of environmental pollution and propose ways to solve geoecological problems, which leads to the formation of geoecological competencies of future geography teachers.

For example, students using an interactive map determine the air temperature, air pollution levels PM2.5, PM10, NO2, SO2, O3, CO, AQI, the impact of dust in the world over the past 50 years. Analyzers influencing factors determine the most polluted areas. For example, a high indicator of carbon dioxide and sulfuric acid was detected in the territory of Southeast Asia, including China (Figure 1).

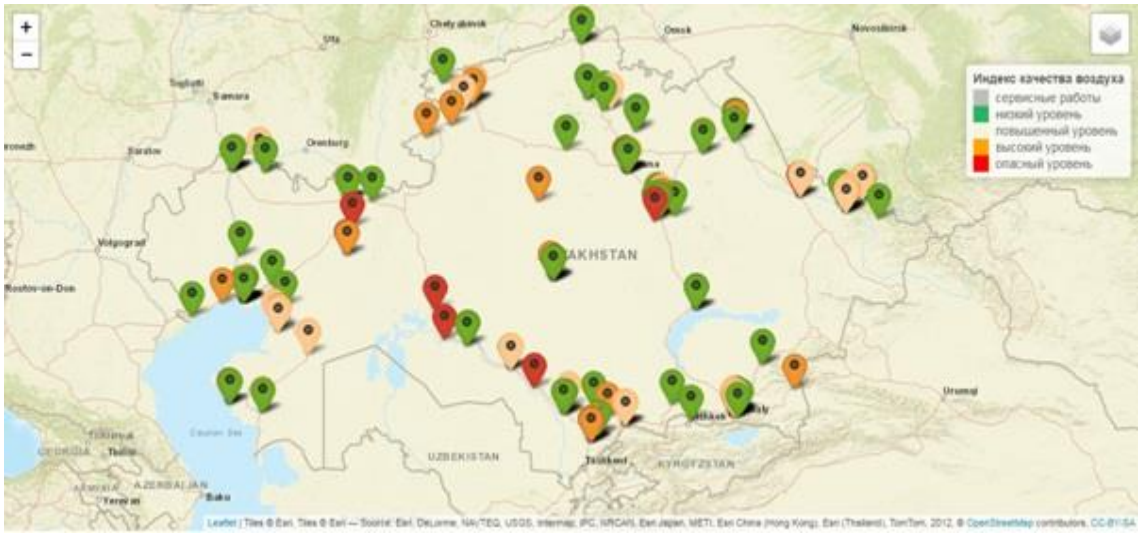
Figure 1

Digital platform ventusky.com



Having analyzed the causes of a high -tech indicator, it was determined that the region is affected by a large concentration of industry and a high population. And to identify factors affecting the territory of Kazakhstan, students used the Airkz mobile application (Figure 2).

Figure 2
Airkz mobile application



Special educational tasks were also developed with the expectation of the formation of geoecological competence (research orientation, the ability to choose the correct production solution based on analysis, synthesis, generalization, etc.mental operations, have sufficiently developed intuition).

The completeness of methodological support was backed up by the conduct of test measurements in order to assess the achieved educational result of the formation of geoecological competence.

For this, the main levels of the formation of the geoecologic competence of students were determined. Very low, low, medium, high, indicators of which were mental abilities, values motivating in action, the ability to apply knowledge and skills in practice. In the experiment, 58 students were accepted, who were divided into two groups: experimental and control, the experiment was conducted in two stages: stating and forming. At the formative stage of the study, additional information-digital materials of geoecological content were used.

The dynamics of a change in environmental knowledge to the stating and forming stages of experimental work in control and experimental groups is presented in figures 3 and 4.

Figure 3

The dynamics of the formation of geoecological knowledge of students of control groups at the stating and forming stages (%)

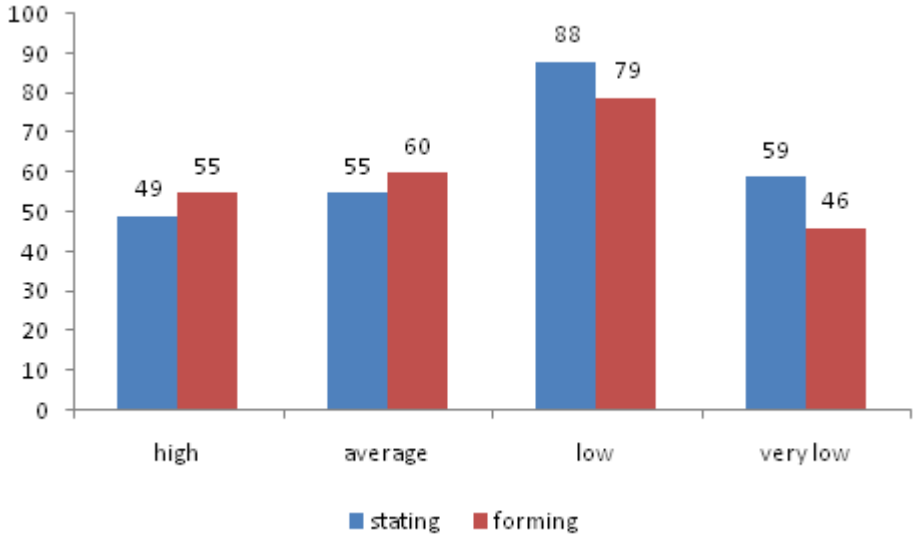
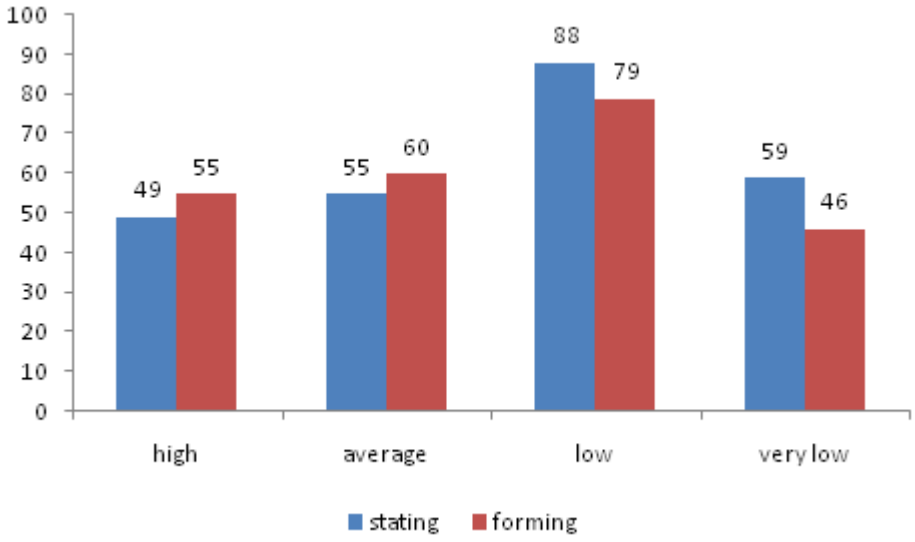


Figure 4

The dynamics of the formation of geoecological knowledge of students of experimental groups at the stating and forming stages (%)



If in the control class the changes were insignificant and made an increase in an increase in the high level of manifestation of environmental knowledge by 6%, then in the experimental class it grew significantly - by 38%and amounted to 89%.

Based on the results of test measurements, the formation of geoecological skills at the forming stage of the experimental group was revealed.

The results obtained allow us to talk about the effectiveness of the developed methodology for the formation of geoecological competence in the process of studying objects of the profile cycle.

It should be noted that this study has limitations as it was conducted on a sample of 58 students from one faculty within one institution. In this regard, it is not possible to generalise the findings to all students in general.

Conclusion

As the study shows, the formation of competence in practice requires a systematic approach, that is, the transformation of components of content based on the use of technologies, the necessary to form students in a sufficient level of competence. The study set a goal to determine the optimal pedagogical conditions for the formation of geography teachers' competence in the learning process.

The study of the modular educational program of the Higher School of Natural Sciences, the pedagogical experience of the author in the preparation of geography teachers made it possible to see the possibilities of forming competence in teaching educational courses of the professional cycle. The implementation of these capabilities was associated with the definition of pedagogical conditions that must be developed and ensured for the effective formation of geography teachers' competence.

As part of research, it was revealed that the educational disciplines of the professional cycle have great potential in the formation of geography teachers' competence. The abundance of educational material of a orientation sets the task of more careful selection and structuring of the content of the curriculum in order to increase the effectiveness of the formation of competence.

Many professionally situations can also be modeled in the system of setting comprehensive integrative tasks and various tasks of and practical orientation.

As recommendations for future research, we can propose an in-depth study of the effectiveness of geography teacher training programmes in improving geo-ecological competence, with a focus on those elements of the programmes that have the greatest impact on the development of skills. In addition, scientific and methodological support of the process of geo-ecological competence formation requires extensive research aimed at developing criteria and indicators of its assessment, determining the levels of its formation, methods of control, as well as finding out its role in the system of education quality indicators, creating tools for measuring geo-ecological competence. Further work in the proposed directions can significantly expand knowledge in the field of geo-ecological competence and contribute to the improvement of the quality of education.

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