

Issues of Development of Natural and Scientific Literacy of Students in Innovative Learning Environment in The Process of Biological Education

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Received: 12 April 2025; Accepted: 08 May 2025; Published: 10 June 2025

Abstract: This article discusses the main aspects of natural science literacy in educational institutions, understanding of nature, its laws, environmental problems and scientific and technical processes, the development of the ability to apply this knowledge in practice, the content and structural components of education, the development of natural science literacy.

Keywords: Science, Biology, Physics, Chemistry, Geography, Ecology, Plant, Animal, Photosynthesis, Aspiration, Practice, Experience, Nature, Thought, Innovation, Technology, Content, Essence.

Introduction: In the education systems of developed countries of the world, special attention is paid to the issue of improving the quality of education and worthy participation in international assessment processes. For this purpose, the lesson on natural literacy based on new innovative technologies is being developed, designed to prepare students for republican and international research. Organizing training sessions is one of the demands of the present time. Our main goal in the educational process is to develop students' competencies in identifying problems that can be solved scientifically in real-life situations, drawing conclusions based on observations and experiments, understanding the world around us and the changes occurring in it as a result of human activity, and making the necessary decisions accordingly.

Scientific literacy is the ability of a person to have knowledge in natural sciences (biology, physics, chemistry, geography, ecology, etc.), to acquire new knowledge based on scientific methods and research, and to respond to the environment on a scientific basis. That is, to provide scientific knowledge, for example, to explain the basic scientific concepts, laws, theories, and application of scientific practices in natural sciences.

Additionally, critical thinking and problem-solving

skills development, that is, in mastering the subjects that students are studying, it is important to develop not only theoretical knowledge, but also the skills to solve practical problems, correctly assess scientific literacy, and find solutions. Scientific literacy is a person's ability to understand and find solutions to scientific, technical, and environmental problems related to nature and the environment. These skills not only provide a person with scientific knowledge, but also teach them to correctly understand the world and nature, and to actively respond to environmental problems. In addition to classroom lessons, extracurricular activities also play an important role in developing students' scientific literacy.

METHODS

In addition to the issues of natural and scientific literacy, it is also worth touching on ecological and social responsibility, that is, issues such as understanding nature and approaching environmental and social problems from a scientific perspective in related issues are also reflected. More precisely, the issue structural components of scientific literacy in order to approach should be familiarized with. In particular, there are several structural components in the development of natural and scientific literacy, which help students

acquire a scientific worldview, form an attitude towards nature, and apply the studied sciences to life. These components include:

To provide students with basic scientific knowledge in natural sciences. This includes the study of the structure and development of the plant and animal world, theoretical information about ecological systems and biological processes.

- Understand scientific laws and relate them to natural processes.

For example, the study of physiological processes such as photosynthesis, respiration, and plant nutrition.

- To provide students with experiential knowledge about the processes and phenomena being studied through scientific experiments, practical exercises, and laboratory work.

- Conducting experiments on plant physiology, such as observing plant photosynthesis or growth rates under different environmental conditions.

- Students learn scientific research and research methodology. Activities such as conducting scientific research, conducting experiments, writing scientific articles and analyzing the results are important for developing these skills.

- Applying scientific methods in the studied subjects, consolidating knowledge through practical research.

- Exchanging ideas and emergence of new ideas among students through scientific discussions, interactive sessions, and group work. This component develops students' scientific thinking and teamwork skills.

- Organizing discussions on various environmental and social issues, for example, protecting plant and animal species, environmental pollution problems and finding scientific solutions to them.

- Environmental education and knowledge focused on nature conservation. In this component, students learn about environmental issues such as the interdependence of plant and animal species, natural resource management, and environmental protection. Students learn to analyze changes in nature, the ecological impact of human activities, and develop methods for preventing them.

The use of new technologies and methods in the development of scientific literacy is also a pressing issue today.

For example, the use of GPS, GIS (Geographic

Information System) and other digital technologies in plant research, and the use of modern laboratory equipment and technologies in students' natural science research are also considered important in increasing educational efficiency.

RESULTS AND DISCUSSION

Natural science in educational institutions

The following factors should be taken into account when developing literacy:

Textbooks and educational materials are also of great importance in the development of natural and scientific literacy in educational institutions, because textbooks and educational materials are the basis of the educational process. They play an important role not only in the formation of students' knowledge, but also in the development of their thinking, logical thinking, and problem-solving skills. In the development of natural and scientific literacy, the importance of electronic textbooks and educational materials is even greater, because these areas serve not only to provide students with scientific knowledge, but also to increase their attitude to nature, ecological culture, and social responsibility.

Textbooks, electronic textbooks on natural sciences (biology, chemistry, physics, ecology, botany, plant physiology, etc.)

The textbook provides students with the necessary scientific knowledge. That is, these textbooks are important for introducing scientific concepts to students, such as the structure of the plant and animal world, ecological processes, and the laws of nature, and the theoretical foundations are important for providing scientific knowledge, theories, scientific methods, techniques, and experimental methods necessary for the formation of natural scientific literacy.

In addition, textbooks and educational materials create an opportunity for students to systematically master scientific knowledge, while at the same time familiarizing them with the basic concepts of the subjects being studied. Textbooks not only provide knowledge, but also help develop scientific thinking in students. Through accurate and clearly written textbooks, students can:

- Logical thinking: They learn to analyze natural science issues, observe processes, and logically analyze results.

- Problem Solving: Familiarize yourself with complex scientific problems and experiments through textbooks, and learn scientific methods for solving them.

Also, interactive textbooks and learning materials engage students actively.

It encourages thinking, which further broadens their scientific horizons.

Textbooks and learning materials allow students to integrate knowledge across disciplines. The components of scientific literacy are closely related to each other:

- Ecology and Biotechnology: Provides information on understanding nature and how to use its resources.

- Biology and Physics: Intertwines knowledge about plant physiology, energy metabolism, and other natural processes.

Textbooks connect this knowledge, while guiding students to understand general patterns and principles across various natural sciences.

Practical exercises are of great importance in the development of natural and scientific literacy. Textbooks and educational materials provide students the with necessary instructions, experiments and experiences in conducting scientific work. For example: organizing experiments and laboratory work in the lesson process, applying theoretical knowledge gained in the lesson process in practice, for example, conducting experiments on plants and plant physiology in Botany lessons, observing the processes of photosynthesis,

respiration and analyzing scientific results.

There are also several advantages to conducting practical classes in the educational process. In practical classes, students test the theoretical knowledge they have learned in practice, which is important for them to fully study nature and further strengthen their natural and scientific literacy. Modern educational materials include not only traditional textbooks, but also digital resources, virtual laboratories, interactive programs and online platforms. This creates a number of opportunities for students: In particular,

- Virtual laboratories: Virtual experiments and simulations in the study of plant physiology.

- Online courses and video lessons: Online resources, video lessons, and interactive courses to further expand and deepen scientific knowledge.

Such resources make learning more interactive and interesting for students. allows you to master it in the form.

In developing scientific literacy, textbooks and educational materials also play a major

role in increasing students' ecological and social responsibility. Textbooks discuss issues such as environmental problems, environmental protection, rational use of resources, and climate change. This, in turn, creates an opportunity for students to feel social and ecological responsibility.

There are also advantages to using innovative educational technologies in developing scientific literacy.

Innovative educational technologies play an important role in raising

the modern educational process to a higher level, in developing students' natural and scientific literacy. The use of innovative technologies increases the effectiveness of directing students in natural sciences (biology, chemistry, physics, ecology, etc.) to effective education, scientific thinking, scientific research, and the development of practical skills. These technologies not only make the acquisition of knowledge more interactive and interesting, but also encourage students to think independently and solve scientific problems. Innovative educational technologies include various tools, methods, and platforms.

Interactive textbooks, video lessons, and simulations make the topics being studied more lively and interesting for students. For example, when teaching various processes in plants and animals in biology or botany, interactive simulations allow students to see the processes visually. Such technologies help students understand processes, i.e., natural scientific phenomena such as photosynthesis and plant growth processes, with greater clarity. When learning practical knowledge, students learn scientific experiments safely and effectively with the help of simulations of scientific laboratory work. In addition, Virtual (VR) and Augmented Reality (AR) technologies are also major innovative tools in the educational process. With their help, students can their knowledge in real and test virtual environments. For example, We can show virtual laboratories. That is, students can study plant physiology, chemical reactions, and other natural processes in a virtual environment without having to go to a real laboratory.

Visual materials play a significant role in developing scientific literacy. For example, Visual Exhibits -Interactive graphics and 3D models allow students to gain a deeper understanding of plant and animal anatomy, ecological systems, and other processes. Virtual Tours - Virtual tours can be organized to explore areas with harsh environments or remote tropical regions. It is effective in the educational

process, for example, they study cactus forests, mountainous areas, or forest ecosystems and gain a realistic impression.

As we noted above, in developing scientific literacy Practice and experience are important sources. That is, through ecological research, laboratory and practical exercises, students are provided with opportunities to conduct scientific work and research in real conditions. These processes play an important role not only in deepening theoretical knowledge, but also in forming scientific thinking, analytical thinking and practical skills in students. Practical experiences in natural sciences, particularly in areas such as biology, chemistry, physics, and plant physiology, make student learning more effective and engaging.

In the development of scientific literacy, practice and experiments allow students to apply theoretical knowledge in real-world situations. This process teaches not only to remember knowledge, but also to understand it more deeply and adapt it to different situations. For example, in Biology and Botany, it is very important for students to study plant growth, photosynthesis processes, and plant structure in laboratory work. Through practice, students learn to conduct scientific research. During process, they conduct the learning various experiments and research based on experience and theoretical knowledge, learn to apply scientific methods. At the same time, they also learn to analyze the results.

Practical exercises teach students work to independently and solve problems. For example, in practical exercises in plant physiology, students observe various physiological processes of plants (e.g., photosynthesis, transpiration) and analyze scientific results. In ecology and environmental protection, students learn about the changes in ecological systems and how to preserve the natural environment. Such practical experience develops scientific thinking skills, students' encourages students to identify problems, analyze them, and find solutions. With the help of practical experience, students can analyze and test, and conduct experiments to confirm or refute scientific hypotheses. For example, in studying the process of photosynthesis in plant physiology, students test their theoretical hypotheses through experiments. In addition, in acquiring new knowledge, practice provides students with the opportunity to learn new knowledge and apply it in practice. Through this, students better understand the theoretical concepts they have learned.

Hands-on experiences encourage students to think innovatively and generate new ideas. For example, biology or botany, new Students conduct in experiments to create new plant species or improve existing species, while the practice also teaches think independently. students to Through experiments and practical exercises, students master independent working methods. learn to independently conduct scientific experiments, collect and analyze data, for example, through practical exercises they gain information about how to conduct scientific research and what scientific methods can be used.

CONCLUSION

Practice and experimentation are very important in the development of natural and scientific literacy. This process not only strengthens scientific knowledge for students, but also allows them to develop scientific thinking, independent thinking and practical skills. Through practical experience, students learn to feel ecological responsibility, conduct scientific research and learn to apply scientific methods. This process also encourages students to develop new scientific approaches and create innovations. As mentioned above, the role of textbooks and educational materials in the development of natural and scientific literacy in educational institutions is extremely important. They help to provide students with scientific knowledge, develop logical thinking, form practical skills, and increase environmental and social responsibility. Textbooks and educational materials are of incomparable importance not only in mastering scientific knowledge, but also in directing students to scientific research and forming their natural and scientific literacy.

Innovative educational technologies help make the educational process more interactive, interesting and effective, and also prepare students to better understand and apply scientific processes in practice. Using these technologies, students develop scientific thinking, conduct independent scientific research and acquire advanced knowledge in the study of nature. The development of natural and scientific literacy in educational institutions serves not only to increase students' knowledge, but also to increase their ecological and social responsibility. The content and structural components of natural and scientific literacy teach students to think scientifically, conduct experiments, solve environmental problems and modern use technologies. Thus, the development of natural and scientific literacy broadens the scientific worldview of students and educates them as active,

responsible and environmentally conscious individuals.

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