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PROBLEMS OF DEVELOPING BIOLOGICAL LITERACY IN SCHOOL STUDENTS BASED ON AN INTEGRATIVE APPROACH

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ABSTRACT

In this article, the problems of developing biological literacy of schoolchildren in connection with other subjects are studied.

Keywords: organic food, GMO, integration, biological education, biological literacy.

INTRODUCTION

In recent decades, the problems facing the society, the attention of the state economy to the knowledge and potential of the individual led to the understanding of the role of education in ensuring the safety of life, activity and development of the individual and society.

Life safety is a state of protection from negative effects that can harm the organism. In the theory of security, life security is defined as "the state of protection of the material world and human society from all kinds of negative effects that can harm the human organism, all kinds of flora and fauna." Thus, the object of security is nature, society and humanity.

In our opinion, the status, content, and purpose of traditional biological education aimed at studying life and the diversity of its manifestations should be changed in the conditions of the crisis development of society. Analysis of the contribution of biological science to the development of society confirms this.

Currently, there is a weakening of general life safety, there is a need to form a culture of health care.

LITERATURE REVIEW

Unprecedented biological discoveries in recent decades (obtaining transgenic plants, cloning organisms, decoding the human genome, using stem cells in medicine, etc.) have changed our perception of nature, not only its limits, but also it is also directing them in unexpected directions. These discoveries, on the one hand, can bring civilization to a new level in terms of quality of life, and on the other hand, they pose a catastrophic risk due to the complete unpredictability of various consequences and the remoteness of their manifestation. According to V.V. Kuznetsov, development of genetic engineering without active provision of biological safety is comparable to, for example, car racing without brakes. The scale, pace and spread of biotechnology's achievements are indicated by the following figures: in 1995, the income from the cultivation of transgenic plants was 75 million US dollars, in 1998 it was 1.5 billion dollars, and in 2010 it reached 25 billion. Unfortunately, even all biologists do not unanimously agree that the discovery of a qualitatively new level of biological knowledge is a unique test for humanity, a test of its maturity. There is no consensus among scientists on the possibility of widespread use of genetically modified organisms (GMOs) as food products due to conflicting information about their safety. At the same time, according to the data of G.G. Onishchenko for

2008, 11.9% of recently inspected food samples contained GMO components, and 47.8% of imported products, 36.4% of manufactured products were of the desired brand.

It is clear that in the coming years, breakthroughs in medicine - fundamentally new technologies can be expected. However, the prospects for the practical application of discoveries in these fields, especially when it comes to genome manipulation leading to changes in existing biodiversity, should not be relied only on the opinion of medical experimentalists and biotechnologists. No matter how you look at these experiments, they cannot be ignored, because the development of scientific research cannot be stopped. In this regard, U. Maturana emphasizes that it is necessary to talk about the observance of scientific ethics: no scientific work should be carried out without recognizing the moral values arising from it. In our opinion, we should not forget the state control over the implementation of scientific discoveries based on the system of regulatory and legal documents. This requirement probably also applies to biological and medical manipulations with stem cells that are widely distributed prematurely. In order to make such decisions, a person must be enlightened, i.e. have relevant knowledge.

In agriculture (cytology, embryology), biological knowledge is widely used in obtaining, freezing, storing and transplanting embryos of valuable breeds and productive farm animals.

DATA ANALYSIS AND RESULTS

Some social problems, such as demographic problems, can be solved thanks to biological research. According to L.F. Kurilo, Vander Borght-de Buerger, it is known that the reserve of gametes and follicles in the female body is formed in the ovary during intrauterine development and then only consumed. Thus, they experience the burden of harmful factors (for example, some antibiotics) during the entire reproductive period of life, which can lead to infertility or pathology of the offspring. Germ cell cryopreservation should be used in part of the population whose activity is associated with health risks. Determining the effect of the serotonin hormone on a person's aggression and depression can affect the conclusions of psychiatrists and psychologists, and in criminology, it can affect the fate of a person.

Thanks to new generation biological technologies, potential is being created that ensures high competitiveness of countries in the world market. Biological knowledge forms the basis of bionics, its object is living systems and their models, which are used as analogues for the further design of robotics and other technical devices, which are of priority in the industry. Creating computer equipment requires knowledge of neurobiology. The industry knows the technologies of microbiological washing of ores, synthesis of enzymes, hormones and drugs. In this regard, many countries began to pay great attention to biological education. A clear example of this is the "Don't be late" project prepared by the US National Commission on teaching mathematics and natural sciences in the 21st century, chaired by the first American astronaut, Senator D. Glenn. The financial support of the project is very large - more than 5 billion dollars per year. However, based on previous experience, developers believe that the decisive factor in solving the problem is not material costs, but new ideas [232, p. 131]. In a globalized economy, the question of whether the next generation of people will be able to solve unexpected problems if they do not have the necessary knowledge in the field of biology is being discussed.

In addition, we cannot ignore trends that pose a more serious threat to the biosphere. Global wood consumption has doubled over the past 25 years. Every hour, 685 hectares of fertile land

turns into desert. Energy resources are decreasing, as a result of the creation of reservoirs and the extraction of fossil fuels, changes in the earth's crust are taking place, and the issue of processing and disposal of nuclear waste remains urgent [160]. The space near the Earth is gradually becoming polluted. In recent years, the natural environment has become increasingly vulnerable to destruction and contamination by xenobiotics, which are toxic to many organisms. Academician V. I. Goldansky notes a special danger that there may be drugs in racemic form that cause serious pathological changes. [69]. In the process of evolution, all forms of life have developed the ability to use only strictly defined optical isomers of chemical substances. Abnormal optical isomers have harmful effects on the body. Their use in the food and pharmaceutical industry threatens to destroy the purity of the biosphere. In the context of political tensions and the emergence of military conflicts, weapons of mass destruction can have a very strong additional racializing effect. Such a result is considered a super-catastrophe that can completely collapse: the extinction of animal and plant life and the final loss of the biosphere.

Disruption of the evolutionarily established and now very dangerous balance between different species can lead to irreversible disturbances in the homeostasis of the Earth's biosphere. According to B.S. Sokolov, the rate of extinction of species at the present time is on average 5 times higher than their natural loss during the evolution period [241]. In his publications, K.S.Losev emphasizes that flora and fauna have become non-renewable biological resources, the intensive destruction of ecosystems - the basis of the biotic mechanism of environmental regulation, the increase in conditions for the existence of life on Earth provides. The destruction of ecosystems is the main problem of the global environmental crisis, so their restoration is a task that must be solved without delay.

The gradual and invisible approach of the environmental disaster, as well as its scale, are understood by scientists and experts who know that any crisis has a hidden initial period. We are already witnessing the consequences of making biologically illiterate decisions on "changing" nature - draining swamps, creating artificial water bodies, recklessly building hydroelectric power stations that block rivers [197, p. 14 ; 320, p. 27]. Biological education has preventive ability to prevent them.

A sign of the times is the emergence of a new position of environmental manager in large companies in developed countries. There is a need for such specialists in our country as well.

Looking at education from the point of view of its tasks, biology can play a methodological role in the study of subjects such as history, which can be viewed from the point of view of biohistory - the history of the interaction between man and nature, the history of scientific development. means Unlike some famous historical figures who determined the course of history in terms of redistribution of living space, they were not engaged in destroying humanity, but in prolonging its life.

The tense geopolitical situation in the modern world leaves no illusions about the possibility of bioterrorist actions. This includes the participation of biologists both in the development of preventive measures and in eliminating the consequences of such situations. Advances in molecular genetics indicate the possibility of inventing a new class of biological weapons aimed at specific ethnic groups. The presence of international terrorism weakens environmentally dangerous objects - water supply systems, nuclear energy, chemical production, etc.

No amount of progress or economic growth can justify the inferiority of biology and education unless we want to set the stage for intergenerational conflict and decline. A clear example of the disparity in understanding the possibilities, advantages and consequences of the aggressive consumerist and technocratic mindset of the Anthropogenic era is the lack of a positive creative model in the field of science and politics to match the destructive power of nuclear weapons. Achievements and developments in the field of biology, if not thought out, can have even more disastrous consequences. Only biologically literate people with a civil position are able to adequately assess and understand the real state of affairs.

Thus, biological knowledge related to the medical, ecological, ethical, economic, and political aspects of life and activity has great potential for forming students' value orientations and a holistic view of the world. Ignoring this function of bioeducation can lead to the loss of spirituality and dehumanization of all areas of human society.

In addition to biological needs, the historical emergence of society led to the formation of new social needs of humanity. Information, new military and biotechnologies have greatly increased the capabilities of man, including meeting his growing needs, which has globalized the problems of a consumer-oriented society. Currently, a renewed ideological approach is required to replace the currently prevailing anthropocentric, technocratic paradigms, reflecting the principle that "We cannot expect mercy from nature, it is our duty to take it from her." The anthropocentric attitude towards the world was formed by itself and firmly rooted not only in the philistine environment, but also in the minds of politicians. According to this attitude, the specific goal of development on our planet is the ever-growing, uncontrollable needs of man, and nature is perceived as an inexhaustible source of unlimited consumption, reflecting the level of ecological consciousness of a consumer society. will be done. However, this formulation of the question is causing a certain controversy.

Opposing ideas characterize the value system of a biocentric, co-evolutionary worldview. These ideas are in line with the World Charter of Nature adopted by the UN General Assembly in 1982. It reads in part: “Humanity is part of nature, and life depends on the continued functioning of natural systems that provide energy and nutrient sources. The genetic basis of life on Earth must not be endangered. The population of any life form, wild or domesticated, must be maintained at least sufficiently to ensure its survival. For this, it is necessary to preserve the necessary habitats". Each living organism performs a special function in the biosphere and is valuable regardless of its consumption value. At the same time, extremes are not always useful in taking any position. Protecting nature, realizing that a person can live only within its laws, while the biosphere remains the only source of life for any living creature, we must not forget that man is the only representative of nature. It develops as a part of it, and in this case it is necessary to remember the rules that reflect the joint evolutionary development of nature and society.

Evolution means "joint development of interacting elements of a single system..., development and maintenance of its integrity". These views were studied by A. Vlavianos-Arvanitis, the head of the Biopolitics International Organization, the European Society of Sociobiology, the Commission on Biological Education of the International Union of Biological Sciences under UNESCO, M.V. Gusev, the initiator of the development of integrative biology, and other scientists. Academician N. N. Moiseyev defined this idea as an ecological imperative of

permissible limits of human activity, which he does not have the right to cross in order to preserve nature and the human species.

In terms of synergetics, coevolution is not the fit of parts into the whole, but the discovery of a universal affinity. Currently, synergetics has reached a new level of understanding the organization of systems. If classical science looks at the world linearly, synergetics looks at the world through non-linearities. This means that the behavior of the nonlinear system is characterized by different modes . Such regimes always include catastrophic explosions of the process, there is a possibility of evolutionary catastrophes in nature. Knowing this prepares new generations for the complexities of the future. Synergetics opens a new level of the unity of nature - the universality of self-organization of various systems: animate, inanimate, social, cognitive.

In the last century, natural sciences deepened and differentiated elementary processes: molecular biology and genetics, genomics, proteomics began to find solutions to problems unimaginable until the twenty-first century. Developing scientific possibilities have raised new questions: "How long can we deal with molecular genetics?", "Do we really have the right to introduce the process of sex change?", "Can we continue to use animals in laboratory research?" Thus, science introduced ethical issues in biology.

According to the definition of N. Oker-Blom, bioethics is a science that studies the social, legal and ethical consequences of new biomedical technology. Bioethics shapes humanistic trends in biological research, ethical problems of psychiatry, transplantology, reproduction, cloning, manipulation of stem cells, and others. A. Jordan, a professor at the University of Geneva, emphasizes that the mechanism of regulating society's life should be updated. However, the lack of scientific culture in society does not yet allow for a wide discussion of issues related to health care (artificial insemination, euthanasia, priorities of scientific research). A.Schweitzer, based on the principle of respect for life, noted: "Only the absolute and universal appropriateness of preserving and developing life is moral, the ethics of respect for life is aimed at this. Any other necessity or expediency is not moral".

A worldview is a form of synthesis and interpenetration of knowledge about reality and its content, it is imbued with meaning, it reflects the phenomena of reality, first of all, not in their objective, but in their semantic connections. Another feature of the worldview is its "claim to express the universal point of view and position of humanity. Therefore, in the most important issues of the meaning of life, the subject of any worldview tends to justify his position as a universal demand arising from the human essence or the world order of things".

Ideological guidelines that form a system of common values and beliefs for the formation of a biologically literate person distinguished by citizenship and responsibility should include biocentrism, bioethics, coevolution, synergetics, cosmism and other ideas.

In addition, it is necessary to treat each person's personality and opinion with tolerance in a multicultural educational space. It is about education in the spirit of peace, mutual understanding and tolerance. We believe that the mass media (television, Internet, advertising) and life in big cities are a powerful factor that can influence the worldview in connection with the processes of globalization and digitalization in the last decade. They are able to deform the real world, ideas about beauty, good and evil, cause aggression, form stable stereotypes, and change the spiritual world of people. This should be taken into account when developing

educational programs. From the point of view of presented philosophical, natural science concepts, ideas and scientific achievements, the worldview importance of biological knowledge is their transformation into stable meaning, views and beliefs that can fulfill the function of regulating human creative activity, maintaining health and life safety, and is to develop culture. All the listed opportunities related to the science of biology, its place in the economy, education are a good reason for the development of citizens' literacy in this field of knowledge, based on the ideological ideas of coevolution, biocentrism, bioethics, etc. aimed at humanization.

Thus, modern biological education is simultaneously a factor of civilization development and global security. On this basis, it should be given a special place in the twenty-first century. Time determines the most important areas of knowledge that have a decisive influence on the development of society. In our time, this role belongs to biology. Studying development trends and ways to solve complex socio-economic, ecological, educational problems, the role of biological science and education leads us to the conclusion that the main task of biological education is to contribute to the preservation of life on Earth, and this biological thinking can only be realized through the development of human consciousness.

CONCLUSION

From this point of view, sustainable development of valuable biological directions is one of the most important problems of school education, which can be fully solved on the basis of extensive integrative knowledge.

Our analysis shows that:

In the teaching of biology, it is necessary to ensure pedagogical conditions and develop methodological support;

It is necessary to develop a didactic model for the development of biological literacy of students of general education schools;

It is necessary to improve the biological teaching technology in general education schools;

It is necessary to think of a mechanism for determining the development of biological literacy among schoolchildren.

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