Critical thinking competence as one of the key skills for bachelors of ecology in the era of the fourth industrial revolution

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Abstract. The article is based on a systematic analysis of the rapid changes in the information society associated with the pragmatics of the "leadership" technologies of the fourth industrial revolution. The authors reveal the role and importance of critical thinking as one of the basic skills needed in the 21st century. The article proves that the development of critical thinking is a key trend in modern education and requires not only an in-depth understanding of this phenomenon, but also new technologies for its implementation in pedagogical practice. The authors note that critical thinking includes the ability to analyze information, evaluate its reliability and make informed decisions. Purpose: Describe the importance of critical thinking in the context of a rapidly changing information society and demonstrate how these skills can be used in various areas of life. Scientific hypothesis: the development of critical thinking should become a priority for educational institutions in order to prepare the younger generation for the complexities and challenges of the modern world.

1 Introduction

The scientific community is increasingly recognizing critical thinking as one of the key skills for successful social and professional adaptation in modern society [1]. This is confirmed both by international experts, such as the World Economic Forum and the PISA study, and by forecasts for the future, which emphasize the growing importance of the ability to think analytically and critically.

In the context of the fourth industrial revolution and rapid changes in technology, social and organizational spheres, critical thinking is becoming an integral component for solving complex problems. Education must adapt to these requirements, providing students not only with theoretical knowledge, but also developing their analytical skills, strategies and procedures for critical thinking [2].

Moreover, in developed countries there is already talk of building an intelligent society, where innovation and scientific achievements play a leading role in creating balanced economic growth and solving social problems. In this context, critical thinking becomes the basis for the development of new strategies and principles necessary to ensure success in an intelligent society.

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In general, the development of critical thinking is an important task of education, which requires further research and development. This skill allows you to successfully adapt to the changing conditions and requirements of the modern world and is a key factor in social and professional success in the 21st century [3].

2 The main

The main problem in studying the nature, role and place of critical thinking in the educational process is the lack of clear, reliable and valid methods that would allow us to investigate this complex phenomenon. An analysis of domestic and foreign literature shows that there are a large number of definitions of critical thinking associated with well-known philosophers, psychologists and teachers. Critical thinking is considered as a separate type of thinking, as a certain attitude, as a special quality trait of a person, and other aspects. There is no unambiguity here. R. Paul, one of the leading US experts in the field of theory and practice of critical thinking, singled out three main "waves" in the context of the historical development of understanding critical thinking. He connects the first "wave" of research (mid-twentieth century) with the understanding of critical thinking based on rationalism and logic, and its development with the processes of checking judgments (W. Glasser, D. Johnson, J. A. Braus, D. Wood). Critical thinking of this period is determined by the readiness to change, test and deny. The intellectual productivity of man is due not to knowledge, but to the constant and courageous search for truth. Critical thinking, according to the scientists of this "wave", is characterized by balance, logic and purposefulness, as well as the use of cognitive skills and strategies that contribute to the achievement of desired results.

In the works of previous researchers of the second "wave" of critical thinking, this concept is concretized depending on the worldview and professional orientations of the authors (D. Dewey, K. Popper, D. Polcock, D. Holt, P. Freire, M. Gutman, S. Brooks, E. Bono, K. Krausen, M. Shermer and others). Some authors define the structure of critical thinking as a special type of thinking, the purpose of which is to evaluate ideas. Others develop methods for the development of critical thinking in the educational process and determine its main characteristics, such as the ability to solve problems and be persistent in solving them, openness to other ideas and the thoroughness of possible options for solving a problem, searching for additional information to confirm or refute a hypothesis, searching for effective ways solving problems and checking the reliability and credibility of evidence, the ability to listen to the opinion of the interlocutor and consider problems from different points of view, the ability to build logical conclusions and forecasts, justify them and set goals, the ability to actively perceive information and apply their skills and knowledge in various situations and etc.

The modern understanding of critical thinking, the third "wave", is focused on the individual and highlighting the special qualities of a person who is able to think critically. It goes beyond a simple set of skills and determines the features of the development of critical thinking [4]. Modern authors argue that critical thinking is not a separate skill, but a combination of several skills. It means being curious, using research methods, asking questions, and systematically seeking answers. Critical thinking also involves "polite skepticism" and doubting accepted truths, developing one's own point of view and being able to defend it with logical arguments.

Most definitions of critical thinking are vague and do not cover all of its aspects [5]. They often highlight only certain characteristics of this type of thinking, depending on the goals of the researcher. However, in each of them you can see the main idea, which is most accurately defined. According to the American educator and psychologist D. Halpern, critical thinking is the use of cognitive techniques and strategies that increase the likelihood of achieving the
desired result [6]. Critical thinking is a specific form of evaluative activity in the process of cognition, which is aimed at determining the reliability of facts recognized as a standard, and at their productive reconstruction and transformation.

The study of the phenomenon of critical thinking and the basic principles on which it is based shows that the implementation of the concept of the development of critical thinking is impossible within the framework of the classical pedagogical paradigm, where the personality is determined by the structure and nature of objective activity, and its formation occurs according to specified standards and parameters. The problematic situation associated with insufficient scientific justification for the development of critical thinking at all levels of education makes it necessary to resolve a number of existing contradictions [7]. First of all, these are contradictions at the social level, between the social order, which is the development of critical thinking in conditions of redundant information and decision-making in uncertain situations based on assessment, and recommendations for the development of critical thinking of the individual, as well as the insufficient level of scientific and methodological training of teacher’s different levels of education. The new pedagogical paradigm implies a change in the role of the teacher in the educational process, requires the development of new principles of the educational environment and optimal systems for the formation of reproductive didactic mechanisms (Table 1).

Table 1. New principles of the educational environment and optimal systems for the formation of reproductive didactic mechanisms

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<td>1</td>
<td>conducting research in order to formulate a hypothesis based on information analysis</td>
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<td>2</td>
<td>assessment of the effectiveness and adequacy of mental activity and identification of possible solutions to the problem</td>
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<td>3</td>
<td>search for additional information to convincingly prove or disprove a hypothesis</td>
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<td>4</td>
<td>finding the most effective ways to solve a problem and checking the validity of evidence on the way to understanding the truth</td>
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<td>5</td>
<td>obtaining a qualitatively new result in their own activities.</td>
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Concept of the development of critical thinking within the framework of the classical pedagogical paradigm (fig.1.). The classical pedagogical paradigm defines a person to a large extent by the structure and nature of objective activity, and the formation of such a person is carried out according to predetermined standards and parameters.
The development of critical thinking is based on four main postulates.

The first postulate states that the development of critical thinking requires knowledge and the ability to generalize information to interpret the problem.

The second postulate indicates the need for logical, consistent and reasoned thinking. Critical thinking involves analysis, reflection and verification of the accuracy of conclusions.

The third postulate states that the development of critical thinking depends on the independence and pragmatism of the individual, who is able to independently solve problems and achieve practical results.

The fourth postulate shows the need for vigorous activity, the ability to propose solutions, plan and predict. Dialogue is an important component of critical thinking, as it allows you to find new ideas and ways to solve a problem.

**Fig.1.** Four main postulates.

The problematic situation associated with the lack of scientific justification for the development of critical thinking at all levels of domestic education arises from the need to resolve existing contradictions:

- The first contradiction lies in the contradiction at the social level between the social order for the development of critical thinking in a multipolar information environment and the implementation of this order in educational practice.

- The second contradiction arises at the scientific and theoretical level due to the need for theoretical understanding of the phenomenon of critical thinking and insufficient scientific validity of this understanding.

- The third contradiction manifests itself at the scientific and methodological level due to the need for scientifically based recommendations on the development of critical thinking and the lack of scientific and methodological support for these recommendations for teachers.

Success in developing critical thinking depends on whether one teaches as a translator or takes on the role of a mentor. He must actively cooperate with the students and experience with them the process of searching for the truth. This requires a new pedagogical approach, which involves the development of principles and optimal systems for the identification and formation of critical thinking, taking into account the characteristics of the post-industrial smart economy.

The main principles (fig.2) of such an approach should include:
stimulating students to study different subject areas and linking their knowledge and skills with various areas of life and work.

bringing real examples and situations that are related to the post-industrial smart economy so that students can analyze and understand them from a critical point of view.

encouraging collaboration and exchange of opinions among students in order to develop their ability for reasoned and critical thinking.

the use of modern information and communication technologies as tools for analyzing, evaluating and solving problems related to the post-industrial smart economy.

pay attention to developing students' skills of introspection and self-assessment so that they can recognize their strengths and weaknesses in critical thinking and work to improve them.

Fig. 2. The main principles

3 Conclusions

The development of critical thinking in the educational process requires taking into account its complexity and specific features, since it is a form of "high-level" thinking. Critical thinking combines synthetic and analytical thinking, allowing students to see the big picture and understand the details at the same time.

All these aspects of critical thinking should be taken into account and developed in the educational process in order to provide students with the opportunity to develop their analytical skills, critical thinking and critical thinking in general. This can be achieved through the use of active teaching methods such as discussions, case studies, problem
situations, etc., which require students to actively participate, think independently and justify their decisions.

References

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