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EVOLUTION OF PRINCIPLES OF CRITICAL ANALYSIS AND OBJECTIVENESS IN THE HERITAGE OF EASTERN THINKERS

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Abstract. This article analyzes the formation and stages of development of the principles of critical analysis and objectivity in the scientific heritage of Eastern thinkers (Al-Farabi, Ibn Sina, Al-Biruni, Al-Khwarizmi, Ibn al-Haytham, Ulugbek). The scientific thinking of the Islamic Golden Age (8th–13th centuries), which developed inextricably linked with ancient Greek philosophy, is one of the important historical roots of the concept of critical thinking today. Based on historical-comparative methodology, the study compares Al-Farabi's doctrine of the stages of thinking, Ibn Sina's theory of empirical knowledge, Al-Biruni's methodology of comparing and verifying sources, Al-Khwarizmi's algorithmic and systematic approach, Ibn al-Haytham's systematic application of the scientific method, and Ulugbek's principle of critical re-examination of information with the components of today's critical thinking. The article discusses the similarities between these historical ideas and modern pedagogical theories, as well as their conceptual differences. Finally, the significance of this heritage in modern pedagogical practice and the limitations of its application are justified.

Keywords: Eastern thinkers, critical analysis, objectivity, Islamic Golden Age, scientific method, empirical knowledge, history of critical thinking, comparative-historical analysis.

Introduction. The modern concept of critical thinking is considered to be largely based on the Western scientific tradition of Socratic dialogue, Aristotelian logic, Baconian inductive method, Descartes' principle of radical doubt, and Dewey's concept of reflective thinking [1; 2]. However, such an approach can create the misconception that critical thinking is only a product of the Western intellectual tradition. In fact, Eastern scholars who absorbed the heritage of Greek philosophy during the Islamic Golden Age in the 9th–12th centuries enriched it with empirical and scientific methods and created a new phase of critical thinking [3].

At the same time, it is important to note that when analyzing the relationship between the ideas of Eastern thinkers and modern theories of critical thinking, it is necessary to take into account the risk of anachronism. Directly equating the ideas of thinkers of the 9th–15th centuries with the cognitive-pedagogical terminology of the 20th–21st centuries can lead to erroneous conclusions. For example, while in Forabiyy the stages of thinking have a metaphysical-ethical basis, in Bloom's taxonomy [8] they have an operational-pedagogical nature. This article, taking into account these conceptual differences, provides a balanced analysis of the similarities and differences between historical ideas and modern theories.

The purpose of this article is to systematically analyze the stages of formation and development of the principles of critical analysis and objectivity in the scientific heritage of Eastern thinkers based on historical-comparative methodology, compare them with the components of modern critical thinking, identify similarities and differences, and justify the significance and limitations of this historical heritage in today's pedagogical practice.

Research methodology.

This study is based on a historical-comparative methodology. This methodology includes three main stages:

Stage 1: Historical contextualization. The ideas of each thinker are analyzed in the socio-cultural, religious-philosophical, and scientific context of their time. In this stage, the original

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works of the thinkers (primary sources) and modern research on them (secondary sources) were studied.

Stage 2: Comparative analysis. The ideas of the thinkers are compared with the components of modern critical thinking (Facione, 1990 [5]) according to the following criteria: (a) analysis and evidence-based; (b) objectivity and impartiality; (c) empirical verification; (d) recognition and correction of one's own errors; (e) systematicity and methodological consistency.

Stage 3: Critical evaluation. Along with similarities, differences and limitations are identified. In particular, the following questions are sought: (a) In what ways do the ideas of Eastern thinkers differ from modern critical thinking? (b) What are the reasons for these differences? (c) What are the limitations of interpreting historical ideas in modern terminology?

The works of Eastern thinkers and modern academic research on them were used as sources.

Theoretical foundations of the concepts of critical analysis and objectivity.

Critical thinking is defined in modern terms as the ability to “systematically and constructively question, evaluate, and draw informed conclusions from information and viewpoints” [4]. A Delphi study led by Facione (1990) identified six core cognitive skills of critical thinking—interpretation, analysis, evaluation, inference, explanation, and self-regulation—[5]. Each of these skills is expressed in the legacy of Eastern thinkers in its own unique way, but in a way that is consistent with the scientific and philosophical context of its time.

It should be noted that modern theories of critical thinking are largely secular in nature, viewing the process of acquiring knowledge as separate from religious-metaphysical foundations. For Eastern thinkers, the search for truth was a combination of scientific and religious-philosophical foundations. This difference suggests the need for caution in interpreting their ideas in modern terminology.

The contribution of Eastern thinkers to the principles of critical analysis and objectivity.

Al-Farabi (873–950): Stages of thought and logical reasoning.

In his work "Treatise on Reason", Al-Farabi consistently described the stages of formation of human thought: potential, actual, acquired, and active reason, and interpreted reason and logic as the main means of understanding truth and achieving moral maturity [6]. In his work "The City of Virtuous People", issues of society and morality are logically analyzed [7].

There is a certain structural similarity between Farabi's stages of thought and Bloom's taxonomy [8]: both systems describe the cognitive process in terms of stages that develop from the bottom up. However, their fundamental focus is fundamentally different. In Farabi, the stages of thought are inextricably linked to the rise of reason with a metaphysical-ethical basis, moral maturity and approaching divine truth. In Bloom's taxonomy, these stages are of an operational-pedagogical nature, they serve only to classify and evaluate educational goals. Therefore, it is scientifically inaccurate to call Farabi's ideas a "direct predecessor" of modern cognitive theories; rather, there is a functional similarity between them, but the conceptual foundations are different.

Ibn Sina (980–1037): Empirical knowledge and an evidence-based approach.

In his work "The Book of Healing", Ibn Sina analyzed cognitive activity in sensory, mental, and intellectual stages, and distinguished an evidence-based approach to scientific thinking [9]. His empirical theory of cognition has functional similarities with some ideas of modern constructivist pedagogy, such as active construction of knowledge and experiential learning [10].

At the same time, there is an important difference between Ibn Sina's theory of knowledge and modern constructivism. While for Ibn Sina the ultimate goal of knowledge is spiritual perfection and the realization of divine truth, in modern constructivism the goal of knowledge is limited to the formation of practical competencies and the solution of life problems. Also, while for Ibn Sina the process of knowledge ends with a metaphysical concept related to the "active mind" (al-aql al-fa'l), in constructivism this process is explained by purely cognitive-psychological mechanisms.

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Al-Biruni (973–1048): Comparison of sources and the principle of objectivity.

In his work *The Book of India* (*Kitab al-Hind*), Al-Biruni put critical thinking into practice by using methods of empirical observation, comparative analysis, and critical examination of sources [11]. Ardi, Abdullah, and Al-Tamimi (2016) describe Al-Biruni as a “great Muslim critical thinker,” noting that he demonstrated the standards of a critical thinker, such as logical correctness in arguments, clear-headedness in conclusions, and honesty in observations [12].

Al-Biruni's methodology is one of the historical examples that comes closest to the "evidence assessment" component of modern critical thinking. The principle of objectivity that he describes - honesty in observations, impartiality towards other cultures, and a willingness to admit one's mistakes - is directly consistent with the basic requirements of modern scientific ethics.

However, it should also be noted that Beruni's principle of objectivity was a unique phenomenon for his time, as he, unlike most of his contemporaries, sought to seek objective truth regardless of religious and cultural differences. This aspect made Beruni's approach progressive not only for his time, but also for subsequent centuries.

Al-Khwarizmi (780–850): Algorithmic thinking and a systematic approach.

In his work *Al-Jabr wa'l-Muqabila*, Al-Khwarizmi advocated an approach to scientific knowledge based on precision, evidence, and calculations [13]. The concept of "algorithm" that bears his name today refers to step-by-step problem solving, systematic analysis, and logical sequence [14].

The main difference between Al-Khwarizmi's approach and modern critical thinking is that it focuses mainly on mathematical and logical issues and does not include methods of critical analysis in a socio-humanitarian context. At the same time, it is no exaggeration to say that his systematic and step-by-step approach served as a methodological basis for the "analysis" and "conclusion" components of critical thinking.

Ibn al-Haytham (965–1040): Systematic application of the scientific method.

Ibn al-Haytham is considered one of the first scientists to systematically apply the scientific method of observation, experiment, hypothesis, and inference in his work *Kitab al-Manazir* (*Book of Optics*) [15]. In his research, he developed methods for testing hypotheses, repeating experiments, and analyzing results. His scientific methodology is later adapted from the inductive method developed by F. Bacon.

When discussing Ibn al-Haytham's scientific legacy, it would be wrong to call his approach a purely "secular scientific method." He combined his scientific research with religious faith and sought to prove the perfection of divine creation through scientific observation in his works. However, it was this aspiration that led him to develop objective observation and experimental methods. His famous phrase, "If I seek the truth, I am not ashamed to admit my mistakes," is a vivid expression of scientific objectivity and self-criticism.

Ulugbek (1394–1449): A critical reexamination of the data.

Ulugbek systematically analyzed astronomical observations and critically revised previously made calculations in his work “*Ziji jadidi Ko'ragoni*” [16]. His scientific research at the Samarkand Academy was based on a combination of empirical observation and mathematical analysis.

The uniqueness of Ulugbek's approach is that he did not hesitate to question the data of his predecessors, including the most influential astronomers of antiquity, such as Ptolemy, and considered it a scientific duty to re-examine them. This is a historical expression of the "testing one's assumptions" and "re-evaluating the evidence" components of modern critical thinking. However, this approach did not lead to a full-fledged scientific revolution during Ulugbek's time - after his death, the Samarkand scientific school declined, and its legacy was not fully appreciated until the European Renaissance.

The connection between the heritage of Eastern thinkers and modern critical thinking.
Key differences and limitations.

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The main differences between the legacy of Eastern thinkers and modern critical thinking theories are as follows:

For Eastern thinkers, the search for truth took place in a combination of scientific and religious-philosophical foundations. For example, while in Al-Farabi the rise of reason is associated with moral perfection and approaching divine truth, in modern critical thinking this process is explained by purely cognitive-psychological mechanisms.

While modern critical thinking is largely viewed as an individual intellectual activity, Eastern thinkers often conducted their scientific research within the framework of collective scientific schools (such as the Ulugbek Academy).

Caution is needed when directly expressing the ideas of 9th–15th century thinkers in 20th–21st century cognitive-pedagogical terminology. For example, calling Ibn al-Haytham's scientific method "a complete prototype of the modern scientific method" does not fully correspond to historical reality, since he combined scientific and religious approaches in his research.

The importance and limitations of the heritage of Eastern thinkers in modern pedagogical practice.

The contribution of Eastern thinkers to the principles of critical analysis and objectivity is significant for modern pedagogical practice in the following areas.

This heritage creates a historical-cultural basis for the development of critical thinking in the Uzbek education system. It reduces the risk of accepting Western models of critical thinking as an "alien" approach and allows them to be assimilated based on national intellectual traditions.

The empirical methodology of Al-Biruni and Ibn al-Haytham serves as historical examples of developing research skills in students. Their experiential-observational approach has functional similarities to modern research-based learning methodology.

Ulugbek's scholarly courage, including the principle of questioning and re-examining authoritative sources, is a historical model for cultivating academic freedom and intellectual courage in students.

When applying the heritage of Eastern thinkers to modern pedagogical practice, it is necessary to take into account the following limitations.

The bulk of this heritage belongs to the fields of mathematics, astronomy, medicine, and philosophy, and their direct transfer to pedagogical practice requires additional methodological developments.

The ideas of Eastern thinkers were formed in the religious-philosophical context of their time, and caution is required in adapting them to the modern secular education system.

The issue of the completeness of available sources and the quality of translation. Many works are translated or commented on in part rather than in full, which creates the risk of misinterpretation.

Conclusions. In the heritage of Eastern thinkers, the principles of critical analysis and objectivity developed inextricably linked with ancient Greek philosophy and reached their peak in the 9th–12th centuries. This heritage is the result of the interaction of Western and Eastern intellectual traditions and constitutes one of the important historical roots of the concept of critical thinking today. The scientific heritage of Al-Farabi, Ibn Sina, Al-Biruni, Al-Khwarizmi, Ibn al-Haytham, and Ulugbek contains approaches that have functional similarities with all the main components of modern critical thinking. The highest similarity is observed in the heritage of Al-Biruni (examination of evidence, objectivity) and Ibn al-Haytham (scientific method, experiment-observation). At the same time, there are conceptual differences between the ideas of Eastern thinkers and modern theories of critical thinking: (a) the difference in metaphysical-religious and secular foundations; (b) the danger of terminological anachronism; (c) the difference between individual and collective approaches. These differences require caution in interpreting historical ideas in a modern context.

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