INTERNATIONAL JOURNAL OF FORMAL EDUCATION

Volume: 4 Issue:1 | January–2025 ISSN: 2720-6874
http://journals.academiczone.net/index.php/ijfe

THE ESSENCE AND THEORETICAL FOUNDATIONS OF THE CONCEPT OF LOGICAL THINKING

Jasurbek Valeriy ugli Solijonov
Researcher at Fergana State University
Orcid ID: 0009-0002-6797-7249

Abstract: *The article studies the theoretical and methodological foundations of developing logical thinking in future teachers, the methodology for developing logical thinking in future teachers based on interdisciplinary cooperation, the effectiveness of developing logical thinking in future teachers based on interdisciplinary cooperation. Also, The essence and theoretical foundations of the concept of logical thinking are analyzed.*

Keywords: *pedagogue, logical thinking, theoretical and methodological basis, competence, improvement, pedagogical, technological, model, didactic, social significance, educational feature, interdisciplinary cooperation.*

Introduction

Logical thinking diverges from conventional reasoning methods toward unconventional approaches, which are notably more engaging, resulting in original decisions emerging in human cognition. These original and unconventional decisions are a driving force that propels modern societies toward progress, development, and economic enhancement. Logical thinking imbues work and activity processes with characteristics such as freedom, liberty, inspiration, and creativity. Thus, while intellect refers to a person's intellectual capacity, creativity is the ability to utilize that intellectual potential purposefully and freely. Consequently, intellectuality is the initial stage of cultivating intellectual potential in youth and preparing them for life in modern society. Creative thinking, on the other hand, demonstrates the development of their ability to harness their intellectual potential and find novel solutions to existing problems. The advancement and adaptability of the mind can be cultivated through specific abstract exercises and knowledge.

Literature review and methods

The tasks related to developing logical thinking have been extensively studied by numerous scholars across various disciplines, and this process continues today. Prominent contributors to this field include Alain Lecomte, Bill Roberts, B.K. Atrostic, Disk van Dalen, Dana Richards, D.H. Autor, C.B. Frey, Michał Walicki, E. Brynjolfsson, J. Monk, Y.M. Kolyagin, L.M. Fridman, L.P. Grishenko, M.Ye. Drabkina, M.V. Goryainov, M.A. Ivanova, A.G. Kurosh, O.S. Stepanova, A. Abduqodirov, R. Djurayev, U. Inoyatov, O. Musurmonova, Kh. Ibraimov, Sh. Abdullayeva, D. Ro'ziyeva, B. Abdullayeva, Z.E. Azimova, G.R. Alimatova, S. Alikhonov, S.T. Aliqulov, M. Aripov, I.V. Makukhina, Kh.B. Norbo’tayev, A.A. Salomov, A.Ch. Choriyev, and D. Sharipova. Their scientific research has explored the philosophical, psychological, and pedagogical aspects of developing logical thinking.

Results and discussion

Logical reasoning has been developed based on the principles of the discipline of logic. According to the theoretical foundations of this field, logic is the science of the fundamental laws and forms of correct reasoning. Logic has its own history of formation and development. The earliest ideas related to logic

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originated in ancient Eastern countries, particularly in India and China. In ancient times, logic was a part of philosophy and had not yet developed as an independent discipline.

The establishment of logic as a separate field of study is associated with Aristotle. He was the first to define the scope of issues that logic addresses. His works, such as Categories, On Interpretation, Prior Analytics, Posterior Analytics, On Sophistical Refutations, and Topics, were devoted to logical matters. Aristotle described logic as the science that "derives unknown knowledge from known knowledge" and "distinguishes true thought from erroneous thought."

Logic examines the manifestations and development of logical reasoning, including the principles that demonstrate the interconnections between thoughts. The purpose of logic is to identify truth and verify accurate reasoning. The object of study in logic is reasoning, which exists in three forms: concepts, judgments, and inferences.

Currently, logic encompasses several branches, including formal logic, dialectical logic, and mathematical logic. Formal logic studies the structure of reasoning independently of the content, essence, and development of thought. It focuses on the rules and logical operations necessary for constructing proper arguments. Dialectical logic examines reasoning in its unity of content and form, as well as in its development. Mathematical logic investigates reasoning using various methods and represents one of the crucial areas of contemporary mathematics, analyzing reasoning within highly abstract and formalized systems.

The forms of logical reasoning include concepts, judgments, and inferences.

• Concepts: A form of reasoning that reflects the general and essential characteristics of objects and phenomena. It is essential to highlight that concepts differ fundamentally from sensory forms of cognition. A concept is not the vivid image of an object but rather its abstract representation. A concept disregards non-essential attributes of an object and, thus, cannot fully reflect it. This abstraction distances it from reality compared to sensory forms of cognition. However, because it reflects the essential characteristics and essence of an object, a concept expresses reality more deeply and comprehensively than sensory cognition. Unlike sensory cognition, concepts do not directly appear in the human mind. They are formed through logical methods such as comparison, analysis, synthesis, abstraction, and generalization. The formation of concepts is intricately tied to language. The connection between concepts and language is a clear manifestation of the relationship between thought and language.

Judgment and Inference In the process of reasoning, some thoughts that emerge during specific operations of reasoning are formed as judgments. Judgment involves affirming or denying something about an object (or person).

Inference is a historically established logical form of reasoning. Using this logical form, new judgments are derived from one or several known judgments (premises). For example, given the judgments: "Like all celestial bodies, the Sun is composed of the same elements as those found on Earth," and "Helium exists in the Sun," we can infer a new judgment: "Therefore, helium also exists on Earth."

Laws of Logical Reasoning The laws of logical reasoning refer to the necessary relationships between thoughts during reasoning, as well as the requirements for constructing correct arguments. These laws include the clarity of thought, consistency and systematicity of reasoning, the principle of non-contradiction, and the use of true premises during reasoning.

To develop logical reasoning, it is necessary to establish the following core competencies:

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Communication skills – the ability to understand a given question, formulate an appropriate response, adopt the interlocutor's position, identify points of agreement and disagreement, constructively engage in dialogue, and develop and justify one's position.

Information processing skills – the ability to follow the overall logic of a presentation, identify key semantic components and their relationships, and analyze data from various sources.

Organizational thinking skills – the ability to structure a problem, identify and allocate the necessary operations to solve it.

Operations of Logical Reasoning Logical reasoning involves the following operations:

Analysis and Synthesis

o Analysis is a reasoning operation that involves mentally or practically examining the properties of objects and phenomena.

o Synthesis involves combining the elements or parts that were separated during analysis into a whole, either mentally or practically. Synthesis is an intellectual activity that unites parts or elements into an integrated whole. Like analysis, synthesis can manifest in varying degrees of complexity, ranging from simple to intricate. These operations help transition from identifying external similarities and differences to understanding the internal essence of phenomena.

Analysis, synthesis, and comparison allow for detailed dissection of objects into components, identification of unique features, and generalization of properties derived from analysis. This enables establishing connections between objects and drawing conclusions.

Comparison is a reasoning operation used in social activities, knowledge acquisition, and the comprehensive reflection of reality. It involves identifying similarities and differences between objects or phenomena, as well as similarities between contrasting features.

Concretization is a reasoning operation that emphasizes certain aspects of phenomena while disregarding their internal connections and relationships. It is the counterpart of abstraction and plays a significant role in human cognitive activity.

Abstraction is a reasoning operation where specific properties, qualities, or attributes of objects and phenomena are mentally separated and treated as independent objects of thought.

In psychology, generalization refers to identifying common properties, features, or attributes in objects and phenomena and grouping them based on these commonalities. For instance, considering the common features of different life stages, terms like "adolescent," "youth," "mature adult," and "elderly" are used. Generalization does not occur independently of abstraction; it is fundamentally based on the process of abstraction.

Classification refers to the system of grouping objects based on their similarities within a category and differences from objects in other categories. A prominent example of classification is Dmitri Mendeleev's Periodic Table of Elements, where elements are systematically arranged based on increasing atomic weight, chemical properties, and other characteristics.

Systematization Operation Through the systematization operation, objects, phenomena, facts, thoughts, and objects are logically arranged based on their position in space and time. The operation of placing objective knowledge—objects and phenomena into a logical, spatial, and temporal order plays a crucial role in knowledge acquisition and the organization of skills and competencies. As the saying goes, "Regardless of what the modern method of thought is called, it must help build constructive ideas and critically identify destructive ideologies. It should also aid in distinguishing truth from falsehood, guiding people to see things as they truly are. The method of modern thought must not only consider the

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interrelations of phenomena, but also be critical of those approaches that combine various relations and connections mechanically without distinguishing essential features or decisive factors." Such an approach is fundamental to successful human cognition and practical activity.

Teaching the elements of logic in higher education institutions is of significant importance. Therefore, improving the quality and effectiveness of teaching logic elements, enhancing the content of such courses, and refining methodologies for teaching logic-related subjects are essential. In connection with this, the curricula, textbooks, and related scientific research at pedagogical higher education institutions were studied and analyzed. Interviews with experienced educators were conducted, and feedback from both teachers and students was gathered.

Conclusion

The use of logic elements in the development of students' logical thinking in pedagogical higher education institutions is crucial. It ensures the integration of interdisciplinary content and the application of information and communication technologies. Teaching logic elements helps strengthen students' reasoning and logical thinking abilities, creating opportunities for them to excel in other subjects. Today, the pedagogical higher education system is tasked with preparing educators who can think innovatively. For this, improving the teaching of logic elements in pedagogical higher education institutions is considered a key priority.

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