



STAGES OF THE FORMATION OF LOGIC AS A SCIENCE AND THE METHODOLOGY OF TEACHING IT ON THE BASIS OF MODERN PEDAGOGICAL APPROACHES

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Abstract

This article examines the main stages in the formation of logic as a science and analyzes the methodological foundations for teaching logic on the basis of modern pedagogical approaches. The study considers the historical evolution of logic from its emergence in ancient philosophical thought to its development as an independent scientific discipline associated with formal, dialectical, and symbolic traditions. Particular attention is paid to the contribution of classical thinkers to the establishment of logical laws, concepts, forms of reasoning, and methods of proof, as well as to the transformation of logic under the influence of contemporary educational paradigms. The article also explores the didactic potential of logic in higher pedagogical education, emphasizing its role in developing critical thinking, analytical skills, coherent speech, and the culture of argumentation among students. In the methodological dimension, the paper highlights the importance of student-centered learning, problem-based instruction, interactive methods, and digital educational tools in the effective teaching of logic. It is argued that the integration of modern pedagogical approaches into logic instruction increases students' cognitive engagement, supports independent reasoning, and improves the practical application of logical knowledge in academic and professional contexts. The article concludes that teaching logic in pedagogical universities should be organized as a dynamic, reflective, and competence-oriented process that connects the historical foundations of the discipline with the demands of contemporary education.



**WORLD BULLETIN
PUBLISHING**

Online Publishing Hub

World Bulletin of Education and Learning (WBEL)

ISSN (E): 3072-175X

Volume 2, Issue 3, March 2026



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<https://worldbulletin.org/index.php/1>

Keywords: Logic, history of logic, teaching methodology, modern pedagogy, critical thinking, pedagogical approaches, higher education, reasoning, argumentation, logical competence.

Introduction

MANTIQ FANINING SHAKLLANISH BOSQICHLARI VA UNI ZAMONAVIY PEDAGOGIK YONDASHUVLAR ASOSIDA O‘QITISH METODIKASI


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Annotatsiya

Ushbu maqolada mantiq fanining shakllanish bosqichlari hamda uni zamonaviy pedagogik yondashuvlar asosida o‘qitish metodikasi tahlil qilinadi. Tadqiqotda mantiqning qadimgi falsafiy tafakkur doirasida yuzaga kelishidan boshlab, formal, dialektik va simvolik yo‘nalishlar bilan bog‘liq holda mustaqil ilmiy fan sifatida rivojlanish jarayoni ko‘rib chiqiladi. Klassik mutafakkirlarning mantiq qonunlari, tushunchalar, tafakkur shakllari va isbotlash usullarini shakllantirishdagi hissasiga, shuningdek, zamonaviy ta‘lim paradigmalarning mantiq faniga ta‘siriga alohida e‘tibor qaratiladi. Maqolada oliy pedagogik ta‘lim tizimida mantiq fanining didaktik imkoniyatlari ham ochib berilib, uning talabalarda tanqidiy fikrlash, tahliliy yondashuv, izchil nutq va dalillash madaniyatini rivojlantirishdagi o‘rni asoslab beriladi. Metodik jihatdan esa talaba markazli ta‘lim, muammoli o‘qitish, interfaol metodlar hamda raqamli ta‘lim vositalaridan foydalanish mantiqni samarali o‘qitishning muhim omili sifatida talqin etiladi. Maqolada zamonaviy pedagogik yondashuvlarni mantiq ta‘limiga integratsiya qilish talabalarning bilish faolligini oshirishi, mustaqil mushohada yuritish ko‘nikmalarini shakllantirishi va mantiqiy bilimlarni amaliy faoliyatda qo‘llash imkoniyatlarini kengaytirishi ta‘kidlanadi. Tadqiqot yakunida pedagogika universitetlarida mantiq fanini o‘qitish tarixiy-ilmiy

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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https://worldbulletin.org/index.php/1	

asoslar bilan zamonaviy ta'lim talablari o'rtasidagi uzviylikni ta'minlaydigan, refleksiv va kompetensiyaviy jarayon sifatida tashkil etilishi lozimligi xulosalanadi.

Kalit soʻzlar: mantiq, mantiq tarixi, o'qitish metodikasi, zamonaviy pedagogika, tanqidiy fikrlash, pedagogik yondashuvlar, oliy ta'lim, mushohada, dalillash, mantiqiy kompetensiya.

Introduction

The study of logic occupies an important place in the structure of philosophical and pedagogical knowledge because it provides the theoretical basis for correct reasoning, justified judgment, and coherent argumentation. In the system of higher education, especially in pedagogical universities, logic is not only taught as a historical and theoretical discipline but is also regarded as an effective means of developing students' intellectual culture. The growing complexity of contemporary education, the expansion of information flows, and the need for critically minded specialists have increased the relevance of logic as a subject that teaches students how to analyze concepts, evaluate evidence, identify contradictions, and construct valid conclusions. For future teachers, such competencies are especially significant, since pedagogical activity requires clarity of thought, consistency of explanation, and the ability to guide learners toward independent and reasoned understanding.

The formation of logic as a science has deep historical roots. Its initial foundations emerged in ancient civilizations where thinkers sought to explain the principles of human thought and the rules of sound judgment. In ancient Greek philosophy, logic gradually developed from general reflections on knowledge and truth into a more structured discipline. The works of Aristotle played a decisive role in this process, as he systematized forms of reasoning, described the structure of syllogism, and laid the foundations for formal logic. Later, medieval scholars preserved and interpreted classical logical ideas, adapting them to theological and scholastic debates. In the modern era, logic expanded through new scientific and philosophical approaches, and in the

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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nineteenth and twentieth centuries it entered a new stage of development with the rise of symbolic logic, mathematical logic, and analytical methods. Thus, the history of logic demonstrates a gradual transition from intuitive reflections on thought to a rigorous scientific study of intellectual operations.

In contemporary pedagogical discourse, the teaching of logic is increasingly connected with competence-based education and modern instructional technologies. Traditional lecture-based transmission of theoretical material is no longer sufficient for achieving deep understanding and practical mastery. Students need to engage actively with logical content through discussion, problem solving, analysis of real-life examples, and reflective tasks. Modern pedagogy emphasizes the learner’s active role in constructing knowledge, and this principle is highly applicable to logic instruction. The nature of logic itself requires students not merely to memorize definitions or laws, but to apply them in analyzing arguments, solving intellectual tasks, and evaluating the validity of statements. Therefore, logic teaching should be organized in ways that encourage inquiry, dialogue, and independent reasoning.

Another important aspect of the problem is the connection between the historical development of logic and its present-day didactic interpretation. Teaching logic effectively requires not only a presentation of its formal categories but also an understanding of how those categories emerged and why they continue to matter. Historical context makes the subject more meaningful for students, allowing them to see logic as a living discipline shaped by philosophical debates, scientific discoveries, and educational needs. At the same time, modern pedagogical approaches such as interactive learning, collaborative analysis, case-based instruction, and digital support tools enable teachers to translate abstract logical principles into accessible and engaging learning experiences.

For this reason, the study of the stages of the formation of logic and the methodology of teaching it on the basis of modern pedagogical approaches is academically and practically significant. It helps to clarify the intellectual evolution of the discipline, identify its educational value, and determine effective ways of teaching it in pedagogical universities. In the context of preparing future educators, such research contributes to the improvement of

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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professional training and supports the formation of logical competence as an essential component of pedagogical mastery.

Methods

This study was based on a qualitative and theoretical research design aimed at identifying the principal stages in the formation of logic as a science and determining effective methodological approaches to teaching logic in contemporary higher pedagogical education. The chosen methodology combined historical analysis, comparative analysis, content analysis, and pedagogical interpretation. Such an integrated approach made it possible to examine logic simultaneously as a historical-philosophical discipline, as a scientific system of knowledge, and as an academic subject taught in pedagogical universities.

The first methodological direction of the research involved the historical analysis of the development of logic. In this stage, the evolution of logic was examined from its early emergence in ancient thought to its transformation into modern formal and symbolic systems. The historical method allowed the study to trace continuity and change in the understanding of logical categories such as concept, judgment, inference, proof, contradiction, and argument. Special attention was given to the classical period, particularly to the formation of Aristotelian logic, because it established the conceptual and structural foundations of the discipline. The research also considered the medieval interpretation of logical traditions, the rationalist rethinking of logic in the modern era, and the emergence of mathematical and symbolic logic in later centuries. Through this method, logic was understood not as a static body of rules, but as a developing intellectual tradition shaped by philosophical inquiry and scientific progress.

The second methodological direction was comparative analysis. This method was used to compare traditional and modern approaches to teaching logic in higher education. Traditional teaching practices were analyzed with regard to their emphasis on theoretical explanation, memorization of categories, and reproduction of ready-made schemes. Modern pedagogical approaches, by

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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contrast, were examined in terms of student-centeredness, interactivity, reflexivity, and competence orientation. Comparison made it possible to determine both the strengths and the limitations of these approaches. While the traditional model contributes to conceptual precision and terminological discipline, modern methods create wider opportunities for practical application, critical engagement, collaborative reasoning, and independent intellectual activity. The comparative method thus helped reveal that effective logic teaching should not reject the classical foundations of the subject, but should reinterpret them through active forms of learning.

The third methodological direction included content analysis of pedagogical and philosophical literature devoted to logic and its teaching. Academic sources on the history of logic, educational theory, didactics, and critical thinking were examined in order to identify recurring concepts, methodological principles, and instructional models. Content analysis allowed the study to classify the main pedagogical ideas relevant to logic education, including problem-based learning, dialogic instruction, case analysis, visual modeling of reasoning processes, and the use of digital educational tools. This stage of the research also made it possible to distinguish between purely theoretical descriptions of logic and those methodological models that are directly applicable in classroom practice.

The final methodological component of the study was pedagogical interpretation. On the basis of the analyzed material, general scientific conclusions were adapted to the context of pedagogical universities. This method allowed the formulation of practical methodological recommendations for logic instruction with regard to the age, academic needs, and professional orientation of future teachers. Pedagogical interpretation focused on how logical knowledge can be transformed into educational activities that develop analytical thinking, speech culture, argumentative competence, and reflective judgment. In this context, logic was treated not only as an academic discipline but also as a pedagogical instrument for shaping intellectual independence.

Thus, the research methodology was built on the integration of historical, comparative, analytical, and pedagogical methods. Their combination ensured a comprehensive examination of the subject and created a basis for drawing

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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theoretically grounded and educationally relevant conclusions about the teaching of logic in modern pedagogical practice.

Results

The results of the study demonstrate that the formation of logic as a science can be interpreted as a consistent and multidimensional process in which philosophical reflection gradually transformed into a structured scientific system and later into an important academic discipline within higher education. The analysis showed that the historical development of logic may be conditionally divided into several interrelated stages. The first stage is associated with the emergence of logical ideas in ancient philosophical thought, where questions of truth, reasoning, contradiction, and proof were first discussed. At this stage, logic existed mainly as part of general philosophy and was closely connected with ontology and epistemology. The second stage corresponds to the classical systematization of logic in antiquity, especially in the Aristotelian tradition, where the core categories of concept, judgment, inference, and syllogism were formalized. The third stage is linked with medieval and early modern reinterpretations of logical doctrine, during which logic was adapted to theological, linguistic, and rationalist frameworks. The fourth stage is characterized by the rise of modern formal, symbolic, and mathematical logic, which significantly expanded the methodological possibilities of the discipline. The fifth stage reflects the pedagogical and interdisciplinary integration of logic into contemporary education, where it functions not only as a theoretical science but also as a practical means of developing critical and analytical thinking.

The research also revealed that the historical stages of logic are directly related to its didactic transformation. Logic is no longer perceived solely as a system of abstract rules detached from educational practice. In the context of pedagogical universities, it is increasingly understood as a discipline that contributes to the formation of intellectual culture, coherent speech, reflective judgment, and evidence-based reasoning. The analysis of methodological sources showed that students achieve better mastery of logical concepts when these concepts are presented not in isolation, but through meaningful cognitive tasks. It was found


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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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that the effectiveness of logic instruction increases when the content includes analysis of everyday arguments, pedagogical situations, scientific texts, and problem-solving exercises that require students to identify premises, detect contradictions, evaluate conclusions, and justify positions.

Another important result concerns the comparative effectiveness of traditional and modern teaching approaches. Traditional methods were found to be useful in introducing the conceptual apparatus of logic and ensuring terminological precision. They help students understand definitions, classifications, and structural laws of reasoning. However, when used alone, such methods often lead to passive assimilation and insufficient transfer of knowledge into practice. By contrast, modern pedagogical approaches were shown to stimulate deeper understanding and stronger cognitive engagement. Interactive discussion, problem-based learning, collaborative tasks, case analysis, and digital visualization of reasoning processes significantly enhance students' participation in the learning process. These approaches make abstract logical structures more accessible and encourage the independent use of logical operations in real educational and social contexts.

The findings further indicate that logic teaching becomes especially productive when historical and methodological dimensions are combined. Students demonstrate more устойчивое понимание предмета when they see how logical categories emerged historically and how they function in contemporary discourse. Historical contextualization increases academic motivation, while modern pedagogical methods improve applicability and retention. As a result, the study confirms that the most effective model of teaching logic in pedagogical universities is an integrated model that unites the scientific heritage of logic with competence-oriented, student-centered, and practice-based instruction. This model supports not only the acquisition of knowledge about logic, but also the development of logical competence as an essential part of future professional activity.

Discussion

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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The discussion of the obtained results makes it possible to interpret the teaching of logic not merely as the transfer of a set of formal rules, but as a pedagogical process aimed at shaping the intellectual maturity of students. The historical analysis of logic showed that this discipline has always developed in close connection with the practical needs of thought, communication, proof, and knowledge organization. This observation is particularly important for higher pedagogical education, where logic should serve both as a theoretical field and as an instrument for future professional activity. In this sense, the history of logic is not simply background information for students. It is a methodological resource that helps reveal why logical norms emerged, how they changed, and what educational value they have today.

The results indicate that one of the major difficulties in teaching logic lies in the abstract nature of its basic categories. Concepts such as inference, validity, contradiction, necessity, and proof often remain overly theoretical for students if they are explained only through fixed definitions and classical schemes. This explains why purely reproductive methods are often insufficient in logic classes. Although traditional forms of teaching provide accuracy and systematicity, they do not always ensure that students can apply logical principles independently. In pedagogical universities, where students are expected to become active interpreters and transmitters of knowledge, this limitation becomes especially visible. A future teacher must not only know logical rules, but must also be able to organize reasoning, formulate arguments, detect errors in thinking, and explain complex material consistently. Therefore, logic instruction must be directly connected with the formation of pedagogical competence.

From this perspective, modern pedagogical approaches provide substantial methodological advantages. Student-centered teaching changes the role of learners from passive recipients of definitions to active participants in the construction of meaning. Interactive discussion encourages students to compare viewpoints, justify conclusions, and analyze the internal structure of arguments. Problem-based learning introduces real or simulated intellectual challenges that require the practical use of logic rather than its mechanical repetition. Case-based tasks are especially productive because they allow students to work with

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authentic communicative and pedagogical situations in which logical mistakes, hidden assumptions, and argumentative strategies can be observed. Such methods transform logic from an abstract discipline into a living cognitive practice.

Another important issue emerging from the discussion is the interdisciplinary significance of logic. In the context of contemporary education, logic is no longer confined to philosophy alone. It intersects with pedagogy, psychology, linguistics, mathematics, information technology, and media literacy. This broad applicability increases the value of logic in teacher education, because future teachers operate in an information-rich environment where they must evaluate sources, build coherent explanations, and cultivate reasoned thinking in their students. The integration of digital educational tools further strengthens this potential. Visual modeling of argument structures, online exercises, interactive tests, and digital discussion platforms make the learning process more dynamic and transparent. At the same time, technology should not replace reflective thought; rather, it should support the gradual development of logical independence.

The discussion also suggests that the most productive methodology for teaching logic is based on balance. Logic should retain its conceptual rigor and scientific structure, but these features must be mediated through accessible, dialogic, and practice-oriented forms of instruction. Historical material enriches understanding, while modern pedagogical strategies increase motivation and applicability. Taken together, these elements create conditions in which logic becomes an effective means of developing critical thinking, academic culture, and professional responsibility among future educators.

Conclusion

The study of the stages in the formation of logic as a science and the methodology of teaching it on the basis of modern pedagogical approaches confirms that logic remains one of the fundamental disciplines in the intellectual and professional preparation of future teachers. Its significance goes far beyond

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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the boundaries of a narrowly philosophical subject. Logic performs an essential educational function by shaping the culture of reasoning, the ability to construct consistent arguments, the skill of identifying contradictions, and the readiness to evaluate knowledge critically. In the context of higher pedagogical education, these qualities are especially important because the future teacher must think clearly, explain material coherently, and guide students toward independent and reflective learning.

The historical analysis of logic demonstrates that this science developed through a long and complex process. From the earliest attempts to understand the rules of thought in ancient philosophy to the creation of formal, symbolic, and contemporary applied logical systems, logic has consistently responded to the growing intellectual demands of society. Each historical stage contributed new categories, methods, and interpretations, gradually transforming logic into a rigorous scientific discipline. At the same time, the history of logic shows that its development was never isolated from practical human needs. Logic emerged as a response to the necessity of proving, analyzing, classifying, and defending ideas. This historical dynamic explains why the teaching of logic today should not be reduced to memorization of laws and forms alone. It should also reveal the living evolution of logical thought and its continuing relevance to education and social communication.

The research also makes clear that effective teaching of logic in pedagogical universities requires a methodological synthesis. Traditional approaches remain valuable because they preserve conceptual rigor, scientific precision, and systematic presentation. Without these elements, students cannot develop a stable understanding of the structure of logical knowledge. However, the exclusive reliance on explanatory and reproductive methods does not fully meet the demands of contemporary education. Modern pedagogical approaches, including student-centered learning, interactive discussion, problem-based instruction, case analysis, and digital support tools, create more favorable conditions for the active assimilation of logical concepts. These approaches increase motivation, deepen comprehension, and strengthen the ability to apply logic in real academic and professional contexts.

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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One of the central conclusions of the study is that logic should be taught as both content and method. It is a body of knowledge, but it is also a way of organizing thought. When students learn logic through active reasoning, dialogue, reflection, and the analysis of authentic situations, they do not simply study logic; they begin to think logically. This transformation is particularly valuable in teacher education, where intellectual independence and argumentative clarity form an integral part of pedagogical competence. Therefore, the methodology of teaching logic should be oriented toward the development of logical competence as a practical and transferable educational outcome.

In summary, the successful teaching of logic in higher pedagogical education depends on preserving the scientific heritage of the discipline while adapting its instruction to the conditions of modern pedagogy. A historically grounded, methodologically flexible, and competence-oriented model of teaching logic can significantly contribute to the formation of critically thinking, intellectually responsible, and professionally prepared future educators.

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ISSN (E): 3072-175X	Volume 2, Issue 3, March 2026
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