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ANALYSIS AND SYNTHESIS, INDUCTION AND DEDUCTION AS METHODS OF COGNITION

Шарипова Навбахор Хакимовна
магистрант Международного Университета Нордик

Abstract:
The article examines the theoretical content, historical roots and practical application of such methods of cognition as analysis and synthesis, induction and deduction. On the basis of scientific data, the author reveals the dialectical relationship between analysis and synthesis, the logical foundations of induction and deduction, and their intercompatibility.

Keywords: Analysis, synthesis, induction, deduction, methods of cognition, dialectics, logic, scientific research, generalization, syllogism.

INTRODUCTION

In our country, great efforts are being made to realize the abilities, talents and intellectual potential of the younger generation, so that they can acquire modern knowledge and professions that meet international standards, and grow up as a comprehensively developed generation with high knowledge and thinking, patriots and noble qualities. The Resolution of the President of the Republic of Uzbekistan Shavkat Mirziyoyev dated July 9, 2019 No PP-4387 "On measures for state support of further development of mathematical education and science, as well as radical improvement of the activities of the Institute of Mathematics named after V.I. Romanovsky of the Academy of Sciences of the Republic of Uzbekistan", and as a consistent continuation of the implementation of this Resolution, the Decree of the President of the Republic of Uzbekistan dated May 7, 2020 No PP-4708 "On measures to improve the quality of education in the field of mathematics and the development of scientific research" was published. On the basis of this Resolution, the "Target Program for Improving the Quality of Education in Mathematical Sciences in the Republic of Uzbekistan for 2020-2023" was developed[3]. The "Standard staffing table of territorial departments of the Institute of Mathematics named after V.I. Romanovsky of the Academy of Sciences of the Republic of Uzbekistan in the Republic of Karakalpakstan, Namangan, Samarkand and Khorezm regions" has been formed.

LITERATURE ANALYSIS AND METHODS

In recent years, significant work has been done in the field of teaching mathematics in our country. In particular, the work on the formation of basic knowledge and skills in mathematics in preschool educational institutions, providing schoolchildren with new, improved textbooks, organizing republican and world Olympiads for pupils and students has been intensively developed. The teaching of mathematics was radically reformed. In this regard, there is a need for the effective use of various scientific methods of teaching mathematics for the further development of logical thinking of students, which means that it is necessary to determine the knowledge of students not only through open, but also closed testing to determine the formation of their mental abilities and the amount of theoretical knowledge. In this regard, President Shavkat Mirziyoyev at a meeting with scientists, young researchers, heads of research institutions and representatives of the industrial sphere expressed the

following thoughts: "Mathematics is the basis of all exact sciences. A child who knows this subject well grows up smart, broad-minded and successfully works in any field." The process of scientific cognition is one of the highest forms of human thinking. In it, the study of the essence of objects and phenomena is carried out by means of logical methods. The fundamental methods of cognition – analysis, synthesis, induction and deduction – have not lost their significance from ancient philosophy to modern methodological approaches. These methods form the logic of scientific research and ensure the validity of scientific conclusions.

OUTCOMES

The process of scientific cognition is complex and requires a deep understanding of the essence of phenomena and processes. In this process, the methods of logical thinking play a special role. The most important of them are analysis, synthesis, induction and deduction, which, complementing each other and harmoniously interacting, form true knowledge.

DISCUSSION

Analysis is a method of studying a complex object or process by dividing it into its constituent elements, widely covered in philosophical literature [3; 3]. Aristotle's logical treatises emphasize the possibility of analysis to reveal the essence of an object by dividing it into elementary units. R. Descartes defined analysis as the basic rule of scientific knowledge [5].

The main objectives of the analysis are:

- disclosure of the internal structure of the object;
- Establishment of logical connections between elements;
- explanation of processes by means of elementary units.

Synthesis is a method of restoring the integral content of an object on the basis of its isolated parts. It is of great importance for the creation of a scientific theory and the formulation of general laws [6]. The objectives of synthesis are:

- formation of a systematic approach;
- Creation of theoretical models;
- ensuring the integrity of scientific conclusions.

According to the dialectical approach, analysis and synthesis are opposite, but inextricably linked methods that cannot function without each other in the process of cognition [8]. Analysis separates the elements, and synthesis unites them into a single system. The cycle of scientific research is carried out precisely through the interchange of these two methods.

Induction is a method of deriving general conclusions from particular facts, proposed by F. Bacon as an experimental basis of scientific knowledge [4]. A distinction is made between complete, incomplete and statistical induction.

Induction is widely used in empirical research, since it allows you to identify general laws on the basis of real facts.

Deduction is a method of deriving particular conclusions from general laws, which found its fullest expression in Aristotle's theory of syllogisms [3].

Deduction finds its application in scientific proof, theoretical modeling, and mathematical research.

Induction and deduction are inextricably linked in the process of scientific cognition: induction helps to make generalizations on the basis of facts, and deduction helps to analyze particular cases on the basis of generalized knowledge[7; 7].

These methods form a logical cycle of scientific research.

Analysis and synthesis are some of the main tools for creating theoretical models in natural sciences, engineering, mathematics, and philosophical research. Deduction is used to logically substantiate theoretical hypotheses. Induction makes it possible to generalize experimental results, and analysis provides a detailed study of the object of study by elements. This is especially important in disciplines such as biology, chemistry, and sociology. Modern scientific methodology is based on the unity of these methods. For example, the systems approach, modeling, and probabilistic analysis are their combined forms [10].

CONCLUSION

In the modern developing era, conducting lessons with the use of modern pedagogical technologies, with the use of various scientific methods and achieving results is an urgent task for every subject teacher. This is due, firstly, to the professionalism and creative potential of teachers, and secondly, to their diverse application in their activities. analysis and synthesis, the most important elements that have a fundamental impact on all aspects of the essence of the object of study are singled out. Analysis and synthesis, induction and deduction are considered fundamental methods of scientific cognition. They are actively used not only in the formation of logical thinking, but also at all stages of scientific research. The dialectical unity of these methods creates an integral system of scientific knowledge, develops conceptual thinking and ensures the reliability of scientific results. Analysis and synthesis, induction and deduction, as universal methods of scientific cognition, are widely used in philosophy, exact and social sciences. Their dialectical unity forms the cognitive process as an integral system and determines the logical basis of scientific thinking. The effective use of these methods increases the reliability, theoretical depth and quality of practical results of scientific research.

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