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DEVELOPMENT OF STUDENTS' ANALYTICAL THINKING THROUGH THE WORKS OF AL-KHWARIZMI

Abstract: This article presents several data on the use of the works of Muhammad ibn Musa Al-Khwarizmi as a pedagogical tool for the formation of thinking skills in students, as well as their analysis of their significance in the modern educational process and the development of creative thinking. In addition, the possibilities of integrating Al-Khwarizmi's methods with modern programming, artificial intelligence and interactive educational technologies are analyzed. This article contains recommendations aimed at implementing the national scientific heritage in modern education and improving the educational process.

Keywords: Al-Khwarizmi, analytical thinking, algorithmic approach, algebra, modern education, pedagogical strategies, artificial intelligence, programming, interactive education, national scientific heritage.

Аннотация:в данной статье представлены некоторые сведения о формировании мыслительных способностей учащихся посредством произведений Мухаммада ибн Мусы Аль-Хорезми, а также анализ их значения в современном образовательном процессе и использования в качестве педагогического инструмента для развития творческое мышление. Кроме того, анализируются возможности интеграции методов Аль-Хорезми с современным программированием, искусственным интеллектом и интерактивными образовательными технологиями. В данной статье приведены рекомендации, направленные на применение национального научного наследия в современном образовании и совершенствовании образовательного процесса.

Ключевые слова:Аль-Хорезми, аналитическое мышление, алгоритмический подход, алгебра, современное образование, педагогические стратегии, искусственный интеллект, программирование, интерактивное образование, национальное научное наследие.

Introduction. Mathematics is one of the main foundations of human thought and science. The concepts and methods derived from mathematics are widely used not only in scientific processes, but also in solving everyday problems. Among the great scientists who left their mark on the development of this field, Muhammad ibn Musa Al-Khwarizmi occupies a special place. Nowadays, mathematical knowledge is not limited to precise formulas and calculations, but is considered a tool for developing analytical thinking and a logical approach. It is Al-Khwarizmi's work "Al-jabr va al-muqabila" that can serve as an effective pedagogical tool for developing analytical thinking in students today.

Literature analysis. The historical role of Al-Khwarizmi: Al-Khwarizmi is known as one of the first scientists to introduce an algorithmic approach to mathematics in his time. In his work "Al-jabr va al-muqabila", systematic approaches to solving mathematical problems were developed. These methods later entered European science and became the basis for the formation of the concept of algebra. This opened up the possibility of considering mathematics not only as a means of calculation, but also as a system of analysis and logical thinking.

Relevance in modern education: Today, in educational systems, great attention is paid to developing students' skills such as not only acquiring knowledge, but also analyzing, solving problems, and making sound decisions. In this regard, the works of Al-Khwarizmi, in particular "Al-jabr va al-

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muqabila", can be used as an important tool in achieving these goals. Based on this work, special methodologies can be developed for developing analytical thinking in students. This article analyzes Al-Khwarizmi's scientific heritage, determines its place in the modern educational process, and offers effective pedagogical methods for developing analytical thinking skills in students. The possibilities of combining the work "Al-jabr va al-muqabila" with modern technologies are also considered.

Research methodology. Al-Khwarizmi and his scientific legacy, Muhammad ibn Musa Al-Khwarizmi (783–850) is one of the most influential scholars of the medieval Islamic world, a person who made a huge contribution to the sciences of mathematics, astronomy and geography. He worked at the Academy of Ma'mun (Bayt al-Hikma) in Baghdad and is known as one of the main leading scientists in scientific research conducted at this institution.

Contemporary significance of his scientific legacy

• Systematic thinking: Step-by-step analysis of complex problems through the work of Al-Khwarizmi teaches students to think logically.

• Algorithmic approach: His work became the foundation for today's modern programming and computer science.

• Multidisciplinarity: Al-Khwarizmi left a huge mark not only in mathematics, but also in the fields of astronomy and geography, which shows the importance of an interdisciplinary approach.

Al-Khwarizmi's scientific legacy is not only of historical importance, but also relevant in the present day. His work "Al-jabr va al-muqabila" serves as a great source for the development of analytical thinking, algorithmic methods and mathematical theory. This work remains an important tool in developing analytical thinking in education today, increasing students' interest in solving complex problems. Al-Khwarizmi's scientific approaches serve not only as a historical heritage, but also as an important source for modern education and technologies. The role of "Al-jabr va al-muqabila" in education Al-Khwarizmi's work "Al-jabr va al-muqabila" with its content and approach occupies a special place not only in the history of mathematics, but also in modern education. This work inspires students not only to study mathematical theories, but also to apply them in practical life issues. The following three main skills are formed through the work: Systematic thinking, systematic thinking refers to the process of analyzing problems by breaking them down into separate parts and bringing each part to a specific solution. Theory of equations: Methods for solving first and second degree equations. Methods for converting practical problems into mathematical equations and solving them. Applied mathematics: Using algebraic methods to solve problems in geometry, economics, and engineering. Development of analytical thinking: Analyzing mathematical problems by breaking them down into parts, identifying logical connections in them, and formulating solutions. The influence of the work on the development of modern mathematics, “Al-jabr va al-muqabila” was translated into Latin in Europe in the 12th century, marking the beginning of a new era in the history of science. It became the basis for the development of algebra and algorithmic approaches in Europe. Al-Khwarizmi's algorithms and methods have now become one of the main principles of modern computer science.

Role in education: The skill of systematic thinking teaches students to analyze complex problems. This method can be applied in modern education to both mathematical problems and problems in other subjects. Logical reasoning, logical reasoning — a method of solving problems by making well-founded decisions at each stage, controlling and justifying the steps. Logical reasoning

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teaches students to make logically correct decisions in difficult situations. This skill is of great importance not only in mathematics, but also in other areas, including:

• Developing critical thinking.

• Logical substantiation of arguments in scientific research.

Creative approach, creative approach — the process of solving problems in new ways, adapting existing knowledge to new contexts.

Research results. Creative learning activities: Encouraging students to solve problems in different ways. This stimulates creative thinking and forms new approaches. The work “Al-jabr va al-muqabila” is important not only for the development of mathematical theory, but also for the development of important skills such as systematic thinking, logical reasoning, and creative approach. By developing these skills, students are prepared to solve complex problems and their chances of success in modern society increase. By effectively applying Al-Khwarizmi’s scientific approaches in education, it is possible to interest students in mathematics and technology and develop their creative potential.

Activities:

• Organizing classes for students on transforming mathematical problems into software solutions based on “Al-jabr va al-muqabila”.

• Example: Solving complex calculations in the field of economics based on algebraic equations.

Research projects:

• Involving students in research projects on the application of equations in Al-Khwarizmi’s work to modern life problems.

• Arousing interest among students in studying the relationship of Al-Khwarizmi’s work with other disciplines, such as physics or chemistry.

Application to modern programming:

• Use in programming languages: Al-Khwarizmi's algorithmic approach can be used to create algorithms for solving problems in programming languages such as Python, Java or MATLAB. For example, writing software code to solve first and second degree equations. Visualizing problems using software modeling and graphics.

• Formation of algorithmic thinking: Developing algorithmic thinking in students by combining equations from Al-Khwarizmi's work with software solutions in programming lessons.

Conclusion. Al-Khwarizmi's scientific legacy, in particular his work "Al-jabr va al-muqabila", is of great importance not only in the development of mathematics, but also in modern educational processes. Arousing interest in mathematics and technical sciences: The work arouses interest in students not only in theoretical knowledge, but also in their practical application. This increases interest in the fields of mathematics, computer science and engineering. The algorithmic approach in the work can be made effective and interesting by applying it to modern programming, artificial intelligence systems and visualization tools. With this approach, students are guided to logical thinking and solving complex problems, which serves as an important tool in improving the quality of

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education. Therefore, research on the introduction of Al-Khwarizmi's work into the national and international education system should be continued.

References:

1. Al-khwarizmi, m. ibn m. the algebra of al-khwarizmi (al-kitab al-mukhtasar fi hisab al-jabr wa al-muqabala). transl. by r. rosen. (1831).
2. Smith, D. E. History of Mathematics. New York: Dover Publications. (1958).
3. Karimov, I. A. The Great Ancestors of Uzbekistan. Tashkent: Sharq NMAK. (1998).
4. Kline, M. (1972). Mathematical Thought from Ancient to Modern Times. Oxford University Press. (1972).
5. UNESCO Al-Khwarizmi and His Contribution to Mathematics. Paris: UNESCO Publishing. (2009).
6. Shadiev, R. Scientific Foundations of Mathematical Modeling. Tashkent: Publishing House of the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan. (2010).