



DEVELOPMENT OF SPATIAL THINKING OF PRIMARY CLASS STUDENTS THROUGH GEOMETRIC MATERIALS

Toshpulatova Ma'mura Ismoilovna

National Pedagogical University of Uzbekistan named after Nizami
Associate Professor of the Department of Mathematics and its Teaching
Methodology in Primary Education

Islamova Gulrukh Jovli kizi

Master's Student of the Department
Theory and Methodology of Education and Upbringing
Master's Student in The Field of (Primary Education)

Abstract

This article examines the issues of developing spatial thinking of elementary school students using geometric materials. Within the framework of the development strategy of the new Uzbekistan, the importance of reforms in the education system, innovative approaches in primary education, pedagogical and psychological foundations of spatial thinking development, and practical experiences were analyzed. The problems identified during the research and proposals for their solution were given.

Keywords: Primary education, spatial thinking, geometric materials, educational reforms, innovative methods, competence approach, digital technologies.

Introduction

One of the important issues in the modern education system is the development of students' ability to think creatively and independently. In particular, visual and practical activities play an important role in the formation of thinking of elementary school students. Spatial thinking is the ability to imagine and analyze



the location, shape, size and movement between objects. This article examines the role of geometric materials as a means of developing spatial thinking.

The relevance of this research is that in order to implement the tasks defined in the development strategy of New Uzbekistan, it is necessary to develop effective methods of developing spatial thinking of students in primary education. The development of spatial thinking on the basis of geometrical materials is important for students not only in mastering mathematics, but also in other subjects and in solving practical life problems.

In the development strategy of New Uzbekistan for 2022-2026 of the President of the Republic of Uzbekistan, the issue of fundamental reform of the education system, education of the digital generation and training of personnel meeting the requirements of the time is defined as one of the priority tasks. It is worth noting that President Sh. M. Mirziyoyev in his work entitled "We will build a free and prosperous society in New Uzbekistan" paid special attention to the issue of "reforming all parts of the education and training system based on modern requirements, raising our young people to become globally competitive personnel with high intellectual potential."

Primary education is considered the foundation of the educational system and forms the knowledge, skills and abilities necessary for successful participation in the future educational process. At this stage, it is especially important to develop logical and spatial thinking, because it is at this age that the child's thinking forms develop rapidly and become the basis for achieving high results in the next stages of education. Spatial thinking plays an important role in the child's understanding of the surrounding environment and understanding of relationships between objects. This way of thinking serves as a foundation for many disciplines, such as mathematics, drawing, architecture, physics. Timely formation of this ability during elementary school is necessary for successful study at the next level.

According to Vygotsky's theory, the child's spatial thinking develops through the socio-cultural environment and education, which means that the role of the teacher is important in this process. That is why it is of particular importance for a primary school teacher to know the methodology of working with geometric materials, the system of special exercises and didactic games aimed at developing students' spatial thinking. L.S. Based on Vygotsky's concept of "zone of proximal development", it is appropriate to give students tasks of gradually increasing

complexity in the process of developing spatial thinking in elementary grades. This allows for education that takes into account the difference between a child's ability to do it independently and to do it with the help of an adult.

Geometric materials and their types:

Geometric materials are didactic tools that help students learn about shapes, figures, volumes and their properties. They are divided into the following types:

- Geometric shapes made of plastic or wood (cube, sphere, prism, cone, pyramid)
- Dynamic models (shapes whose edges can move)
- Mosaics and LEGO blocks
- Digital geometric programs (GeoGebra, 3D modeling programs)

Methods such as practical exercises, tasks based on imagination, integration with digital technologies, and group work effectively help in the development of spatial thinking through geometric materials. For example: by engaging students in making, dividing and assembling geometric shapes, their hand motor skills and thinking will be developed, "What if we rotate the cube through questions such as "shall we see?", students' spatial imagination is easily formed. The use of virtual 3D models allows children to see shapes from different angles, understand their properties, solve and discuss multi-shaped problems in a group, and strengthen logical thinking and spatial awareness skills. During our research, the following innovative methods were developed and tested:

1. "Geometric constructors" method - students develop their spatial imagination by creating complex constructions, analyzing and explaining them using different geometric shapes.
2. "Mental rotation" exercises - development of students' spatial thinking by mentally turning, moving and changing various geometric shapes.
3. "Geometric analogies" method - students expand their spatial imagination by comparing objects in the environment with geometric shapes and finding similarities.
4. Using digital technologies - studying geometric materials using 3D modeling programs, virtual reality applications, and interactive learning resources.
5. STEAM approach - teaching geometric knowledge in connection with science, technology, engineering, art and mathematics, developing spatial thinking through practical projects.



The comparative analysis between the experimental and control groups showed that the proposed methodology significantly improved the students' spatial thinking. In particular:

- In the experimental group, the indicators of recognition and classification of geometric shapes were 27% higher than in the control group;
- 31% advantage in understanding and analysis of spatial relations was noted;
- Indicators of analytical thinking in solving geometric problems increased by 24%;
- There was a 33% difference in creative thinking and the ability to create new constructions from geometric shapes.

The following suggestions are given for the development of spatial thinking of elementary school students with the help of geometric materials: the introduction of more geometric assignments and games that develop spatial thinking into elementary school textbooks and methodical manuals, the organization of more special training and seminars for teachers, the introduction of digital technologies, 3D modeling tools (for example, GeoGebra, virtual constructors) into elementary school mathematics classes, the provision of schools with didactic tools (plastic geometric forms, LEGO sets, visual aids, etc.), the development of special tests that assess the level of spatial thinking and their regular use in classes, the promotion of games and exercises aimed at developing children's spatial thinking in cooperation with parents will effectively help in achieving the expected result, that is, in developing students' spatial thinking. The development of spatial thinking in primary education is an important process not only for mathematical knowledge, but also for general thinking, finding the right way in problem situations, and developing creativity. Geometric materials are a very effective tool in this regard, and by their correct selection and methodical application, the level of knowledge of students is significantly increased.

In conclusion, it should be noted that the development of spatial thinking through geometric materials serves as the basis not only for learning mathematics, but also for the entire thinking process for elementary school students. Such learning methods are important for children to perceive shapes, sizes, and their mutual location. Teaching with geometric materials not only teaches children concrete scientific knowledge, but also creative thinking, logical analysis, and complex problem solving. Through this, they form not only a mathematical, but also an



approach to problems in life. Such a methodology creates a solid foundation for the general intellectual development of students, as well as for their future success. By working with geometric shapes, children learn to see every issue from a new perspective, think abstractly, and understand the world around them. This increases their interest in knowledge, makes the educational process more effective and meaningful.

The proposed methodology will contribute to the implementation of the tasks defined in the development strategy of New Uzbekistan, the education of the digital generation and the training of personnel who meet modern requirements.

REFERENCES

1. Mirziyoyev Sh.M. We will build a free and prosperous society in the new Uzbekistan.T.: "Uzbekistan", 2021..
2. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 "On the development strategy of New Uzbekistan for 2022-2026". <https://lex.uz/docs/58410633>
3. Piaget J. The Child's Conception of Space. - London: Routledge, 1956.
4. Vygotsky L.S. Thought and speech. - Tashkent: "Teacher", 2010. - 324 p.
5. Jumayev M.E., Tadzhiyeva Z.G. Teaching mathematics in primary gradesmethodology. - T.: "Science and Technology", 2018. - 304 p.
6. Bikbayeva N.U. Methodology of teaching mathematics in primary grades. - T.: "Teacher", 2017. - 328 p.
7. Toshpulatova M.I. Pedagogical and psychological foundations of development of abilities of primary school students. - T.: "Science and technology", 2019. -216 p.
8. Begimkulov U.Sh. Modern information technologies in pedagogical educationsscintific-theoretical foundations of implementation. - T.: "Science", 2018. - 180 p.
9. Ministry of Public Education of the Republic of Uzbekistan. Elementary Mathematics Curriculum. - T., 2023.
10. Yusupov A.R. Development of mathematical abilities of elementary school students: Doctor of Philosophy (PhD) dissertation in Pedagogical Sciencesautoreferati.-T.,2021.-58b.
11. Gafforova T., Shodmonova Sh., Eshturdiyeva G. In primary educationmodern pedagogical technologies. - T.: "Tafakkur", 2021. - 204 p.