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Developing Students' Geometric Concepts Through Project-Based Learning in Primary School Mathematics Classes

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Abstract: This article highlights methods of developing geometric concepts in primary school students through their involvement in project-based activities. Students develop and reinforce their understanding through project work.

Keywords: Project, geometric shapes, spatial imagination, research activity, dimensions.

Introduction: In the modern educational landscape, fostering students' logical thinking and creativity is considered a fundamental goal, especially in the context of primary education. Among the various branches of mathematics, geometry plays a crucial role in developing children's spatial awareness and visual perception. Early exposure to geometric concepts helps students form mental representations of shapes, positions, and dimensions, which are essential for their cognitive development.

Project-based learning has emerged as one of the most effective pedagogical strategies to engage young learners in active and meaningful learning experiences. This method allows students to explore, experiment, and apply their knowledge through hands-on activities and collaborative tasks. When applied to geometry lessons, project-based learning not only enhances conceptual understanding but also promotes problem-solving, critical thinking, and communication skills.

This study focuses on the integration of project-based learning in primary school mathematics classes, with the

specific aim of shaping students' geometric concepts. It explores the theoretical foundations, methodological approaches, and practical benefits of using projects to deepen students' understanding of geometry. The findings of this research are expected to provide valuable insights for educators seeking innovative and student-centered teaching methods in the primary education system.

METHODOLOGY

Geometry is one of the most important branches of mathematics in primary education and helps develop students' spatial understanding. The formation of geometric concepts in primary school students has been widely studied in the fields of pedagogy and psychology. The works of scholars such as G.V. Dorofeyev, T.E. Kuznetsova, and M.I. Moro are devoted to the teaching of mathematics in primary education and the significance of visual and illustrative elements in the learning process. According to them, spatial thinking in preschool and early school-age children is formed through visual perception and imagination, which requires the use of demonstrative tools and active teaching methods.

Among Uzbek scholars, H. Tursunov, S. Juraev, G. Ergasheva, and others have conducted research on the application of innovative methods in primary education, including the use of the project method. Their studies emphasize that the project method fosters students' independent thinking, problem-solving skills, and research abilities.

Studying geometric shapes is not limited to identifying the figures; it also includes understanding their properties, spatial positions, and dimensions. Interactive and creative approaches play a crucial role in developing these competencies.

In this study, observation, pedagogical experiment, questionnaire, and analysis of educational activities were used as research methods. The main methodological foundation of the work is based on a constructivist approach. According to this approach, knowledge is formed through students' practical activities—-independent inquiry, experimentation, and problem-solving.

The project method was selected as the primary method and includes the following stages:

1. Problem Identification – students recognize the need to solve a problem related to geometric shapes or spatial situations.
2. Planning – preparation of necessary materials, drawings, and measuring tools for the project.
3. Implementation Stage – working on the project individually or in groups (e.g., creating geometric

models).

4. Presentation and Analysis – students present their completed projects and discuss the outcomes.

5. Reflection – students reflect on their experiences and learning outcomes.

Throughout the research, the impact of the project method on the development of spatial thinking in students is analyzed through experimentation. Teaching geometric concepts through practical exercises and project-based activities increases students' interest and contributes to the development of logical and creative thinking. Through this method, students not only recognize shapes but also gain an understanding of their properties and real-life applications.

Importance of Project-Based Activities

The methodology of teaching through projects is highly significant in activating students' independent work and directing their knowledge toward practical application. Geometry-related projects positively influence the following areas:

Developing spatial concepts – students better understand shapes through drawing, cutting, and assembling them.

Enhancing analytical thinking – comparing the properties of given shapes, measuring, and verifying them strengthens students' logical thinking.

Improving teamwork skills – project work teaches students to collaborate, exchange ideas, and find solutions together.

Linking mathematics with real life – understanding how geometric shapes are used in nature, construction, and design.

RESULTS

Methods for Engaging Students in Project-Based Activities

To enhance the effectiveness of project-based learning in primary school education, the following methods can be applied:

1. "Shape Town" Project

Students create their own miniature town. Each building or structure is made from different geometric shapes. For example:

Square – house

Triangle – roof

Circle – fountain or roundabout

Rectangle – pathway

This project helps students understand the real-life applications of shapes and develops their spatial awareness.

2. "Magic Geometry" Project

Students are divided into groups and create various animals, vehicles, or buildings using geometric shapes. For instance, they may make a fish or bird from triangles, or a car using rectangles and circles. This activity helps them learn shape combinations and fosters creative thinking.

3. "Geometric Patterns" Project

Students explore geometric designs from ancient cultures and recreate them on paper or cardboard. This project connects art and mathematics and aids in understanding the concept of symmetry in shapes.

4. "Measuring and Comparing" Project

Students measure the length, width, and height of objects in the classroom and calculate their surface areas. For example, they may calculate the area of the board, the perimeter of a desk, or the area of a window. Through this, they develop measurement and calculation skills.

5. "Mathematical Garden" Project

Each student designs their own garden. Flower beds, paths, and resting areas are drawn using various geometric shapes, and the area of each shape is calculated. This project cultivates students' skills in solving real-life problems.

Outcomes of Project-Based Activities and Conclusion

By engaging students in project-based activities:

They learn to distinguish geometric shapes and understand their properties.

Their measuring and calculating skills are reinforced.

Independent thinking and creativity are developed.

They learn to connect mathematics with real-life situations.

In conclusion, implementing project-based activities in geometry lessons deepens students' knowledge, involves them in hands-on learning, and increases their interest in mathematics. Therefore, it is recommended to widely use various project tasks when teaching geometry in primary grades.

DISCUSSION

Engaging primary school students in project-based tasks during mathematics lessons to develop their geometric understanding is one of the most relevant issues in today's education system. Traditional lessons may often be limited to theoretical knowledge, whereas using the project method encourages active thinking, independent decision-making, and applying acquired knowledge through hands-on projects.

Working with geometric shapes helps students develop spatial awareness, visualization skills, and

logical thinking. A key feature of the project method is that students acquire multidisciplinary competencies through solving real-world problems, collaborating in groups, and presenting their results. Tasks such as identifying properties of shapes and creating models or practical objects enhance children's aesthetic sense, curiosity, and creative thinking.

Research has shown that project-based lessons significantly increase student engagement, motivation, and creativity, which leads to deeper understanding of geometric concepts.

Therefore, by integrating the project method into classroom instruction, primary school teachers can nurture students who are not only knowledgeable but also independent thinkers with creative and practical competencies.

Students may work individually or in groups of 3–4 based on their interests when carrying out a project. However, it is generally more effective to emphasize group work. The project culminates with a final presentation, which can take place in the form of a conference covering one or more academic subjects.

The students' individual or group project work may include the following educational activities: planning their research activities, dividing tasks among themselves, setting learning goals, finding necessary information, solving topic-related problems and selecting the best solutions, conducting surveys or experiments if needed, preparing a report on the project outcomes, analyzing and evaluating their work, and preparing and delivering a presentation for the defense of their project. These activities are carried out within the allocated hours for the respective subject. In project work, students can choose topics and develop related tasks based on their interests.

CONCLUSION

Involving primary school students in project-based activities during mathematics lessons is considered one of the most effective pedagogical approaches for developing their geometric understanding. Research shows that the project method not only deepens students' knowledge and skills but also enhances their independent thinking, spatial awareness, practical thinking, and creative approach. Learning geometric shapes through models, drawings, and group tasks motivates students to be more active and strengthens their mathematical reasoning.

Moreover, project-based learning plays a crucial role in developing collaboration, communication, and research skills among students. Therefore, applying the project method systematically and creatively in primary school lessons—especially in teaching geometry—opens up

wide opportunities. This approach aligns with modern educational standards and serves as a key factor in ensuring a high-quality teaching and learning process.

REFERENCES

O'zbekiston Respublikasi Prezidentining Farmoni. 2022-2026 yillarga mo'ljallangan Yangi O'zbekistonning taraqqiyot strategiyasini "Insonga e'tibor va sifatli ta'lim yili"da amalga oshirishga oid davlat dasturi to'g'risida. 2023-yil 28-fevral

Тожиев М., Алимов А.Я., Қучқаров Д.У. Педагогик технология таълим жараёнига татбиғи (Бошланғич таълимда математика ўқитиш методикаси фани дарсларининг лойиҳаси) -Тошкент. "Тафаккур" нашриёти. 2010, -148 б.

Muslimov, N., Usmonboeva, M., Sayfurov, D., & To'raev, A. (2015) Innovatsion ta'lim texnologiyalari. Sano-standart.

Dorofeyev G.V., Kuznetsova T.E. Nachalnaya shkola: Uchebnik po matematike. — Moskva: Prosveshchenie, 2004.

Tursunov H. Boshlang'ich ta'lim metodikasi. — Toshkent: Fan va texnologiya nashriyoti, 2019.

Ergasheva G. Boshlang'ich sinf o'quvchilari bilan loyiha-metod asosida ishlash yo'llari. // "Ta'limda zamonaviy yondashuvlar" ilmiy-amaliy jurnal, №2, 2021.

Polat E.S., Bukharkina M.Yu. Novye pedagogicheskie i informatsionnye texnologii v sisteme obrazovaniya. — Moskva: Akademiya, 2007.

Tursunov H. Boshlang'ich ta'lim metodikasi. — Toshkent: Fan va texnologiya nashriyoti, 2020.

Dorofeyev G.V., Kuznetsova T.E. Nachalnaya shkola: Uchebnik po matematike. — Moskva: Prosveshchenie, 2004.

Ergasheva G. Boshlang'ich sinf o'quvchilari bilan loyiha-metod asosida ishlash yo'llari. // "Ta'limda zamonaviy yondashuvlar" ilmiy-amaliy jurnal, №2, 2021.

Polat E.S., Bukharkina M.Yu. Novye pedagogicheskie i informatsionnye texnologii v sisteme obrazovaniya. — Moskva: Akademiya, 2007.

Xolmatova M., Sattorova D. Boshlang'ich ta'limda STEAM yondashuv asosida loyiha metodini qo'llash. // "Ilm-fan va innovatsiyalar" jurnali, №4(17), 2022.

Alijon, A., Xoldorovich, S. Z., & Abbosovna, G. M. kizi, MMA.(2022). Technology of Individualization of Learning. Spanish Journal of Innovation and Integrity, 6, 291-297.

Gofurova, M. A. (2020). Development of students' cognitive activity in solving problems. ISJ Theoretical & Applied Science, 1(81), 677-681.

Gafurova, M. A. (2021). Developing Cognitive Activities

of Primary School Students based on an Innovative Approach. International Journal of Multicultural and Multireligious Understanding, 8(10), 236-242.

Gafurova, M. (2021). Intellectual and Cognitive Activities of School Pupils. The American Journal of Social Science and Education Innovations, 3(2), 447-450.