DEVELOPMENT OF FINE MOTOR SKILLS IN PRIMARY SCHOOL STUDENTS THROUGH HEJNY METHOD IN TEACHING MATHEMATICS

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Abstract

This study deals with the influence of innovative mathematics teaching according to the Hejny method on the development of fine motor skills of 1st-grade primary school pupils. The intervention program was implemented through creative lessons that used manipulative and spatial tools (e.g. geodesics, building blocks and cube models). Fine motor skills were diagnosed using the subtest "Composing and carrying beads" from the standardized MABC-2 test. The results showed a statistically significant shift in fine motor skills in pupils taught using the Hejny method compared to the control group with traditional teaching. The research pointed out the importance of practical activities as a tool to support not only motor, but also cognitive and spatial development of children. The starting points of this work can serve as inspiration for pedagogical practice in the field of primary education.

Keywords: fine motor skills, Hejny method, mathematics teaching, work activities, spatial imagination, manipulative tools

1. Introduction

The development of fine motor skills is an important aspect of a child's school readiness and significantly influences their success in writing, drawing, and manipulating learning materials. Fine motor skills are closely linked to other areas of development, especially spatial perception and cognitive skills, which are essential for mastering mathematical concepts.

Hejny's method of teaching mathematics is currently considered one of the progressive forms of teaching, which uses a manipulative environment and emphasizes the student's independent work. Children are not passive recipients of knowledge, but become active constructors of their knowledge, through work with specific objects, models and spatial structures. This approach significantly contributes to the comprehensive development of the child, as it connects movement, perception and thinking.

This study aimed to determine whether and how teaching mathematics using the Hejny method – in combination with practical activities, supports the development of fine motor skills. The research was conducted in two fourth grades, where one group was taught traditionally and the other according to the Hejny method, both of which received three structured lessons focused on manipulation and creation.

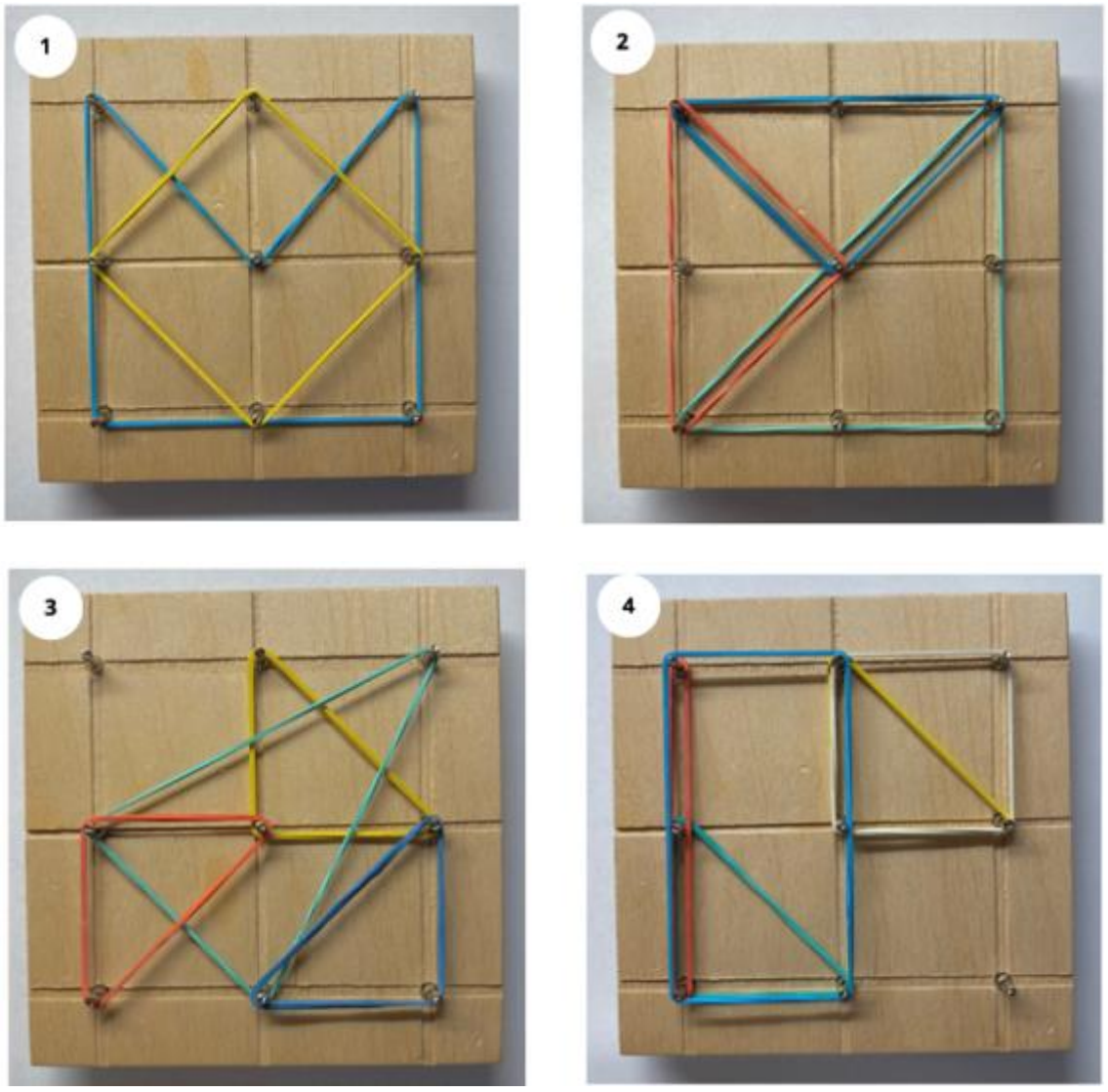
2. Theoretical foundations

2.1. Fine motor skills and their importance

Fine motor skills include coordinated movements of small muscle groups, especially fingers and hands, which are necessary for everyday activities such as writing, cutting, threading or folding. Its development is tied to the maturation of the central nervous system (Dylevský, 2022) and is reflected in overall dexterity, accuracy, and control of movements. The importance of fine motor skills for a child's school success is also confirmed by Psotta (2016) and Bednářová (2022), who emphasize its influence on graphomotor skills, concentration and speech development.

2.2. Hejny's method in teaching mathematics

Hejny's method of teaching mathematics is based on the principles of constructivism and respects the individual developmental pace of the student. An important part of this method is working with so-called environments, such as stairs, geodes, cubic structures, or number lines, which allow students to independently discover mathematical relationships (Hejny et al., 2011). Manipulating these environments also stimulates fine motor skills and spatial perception.



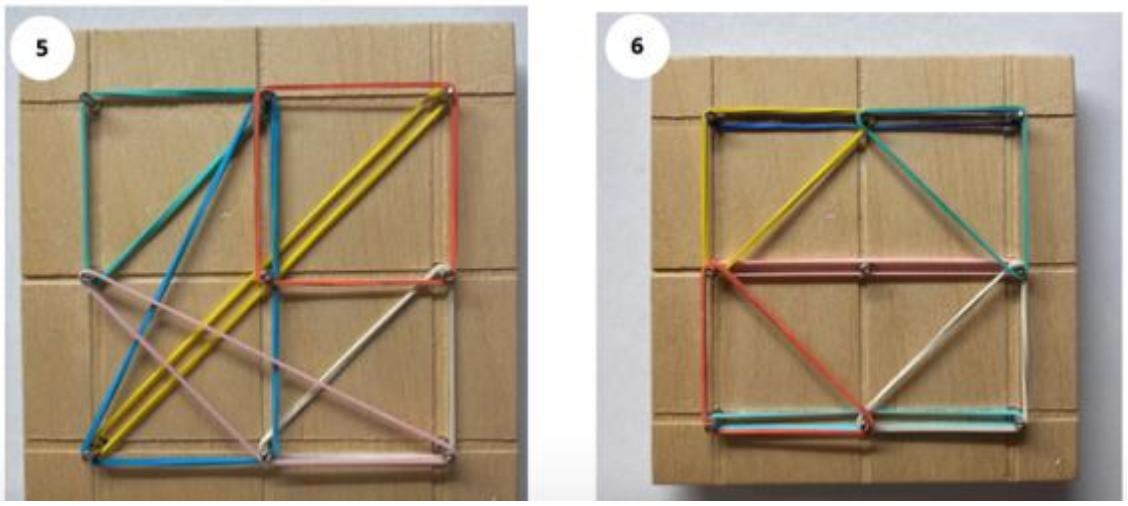


Figure 1. Geodesic input

As gradation parameters, we can mainly find the number of rubber bands, the increasing color of the rubber bands, the amount of overlapping (layers), and the complexity of the shapes.

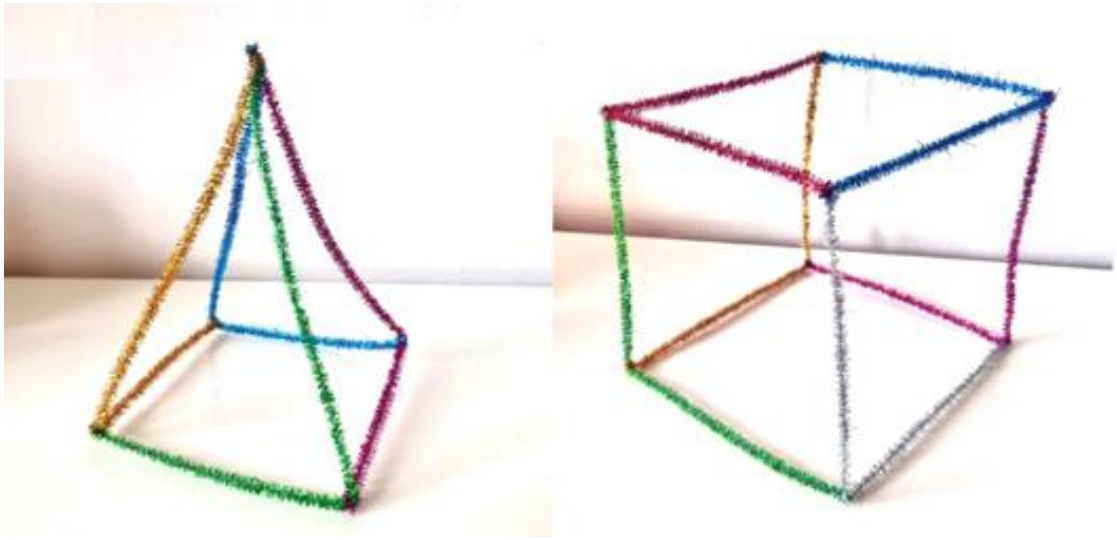


Figure 2. Entering shapes and solids

Gradation in the assignment appears in the form of the assignment, in the complexity of the shape and later the solid, in the addition of conditions in working with beads.

2.3. The importance of practical activities in teaching

Practical activities that use small objects, creative tasks, and spatial manipulations naturally strengthen hand-eye coordination, precision of grasp, and motor planning. Their inclusion in teaching creates favourable conditions not only for the acquisition of knowledge but also for the development of self-confidence, concentration, and joy of learning (Bednářová, 2022; Mertin, 2011).

3. Methodology

The research sample consisted of students from two fourth grades (n = 37) – one class was taught in the traditional way (n = 19), the other using the Hejny method (n = 18). The subtest "Putting and carrying beads" from the MABC-2 test was used to assess fine motor skills. The intervention program included three creative lessons with mathematical content:

- **Lesson 1:** Working with geodesics – creating shapes according to the assignment.
- **Lesson 2**: Assembling geometric shapes and bodies from various materials.
- **Lesson 3**: Building 3D models from cubes according to the template.

Before and after the intervention, students were tested, and the results were subsequently analysed with a two-sample t-test.

4. Results

Statistical analysis showed that students from the experimental group (Hejny method) achieved significant improvement in fine motor skills between pretest and posttest ($p < 0.05$), while in the traditionally taught group, this progress was not as significant. In tasks focused on accuracy and coordination, the experimental group was more successful, which indicates a positive effect of manipulation with didactic tools on motor development.

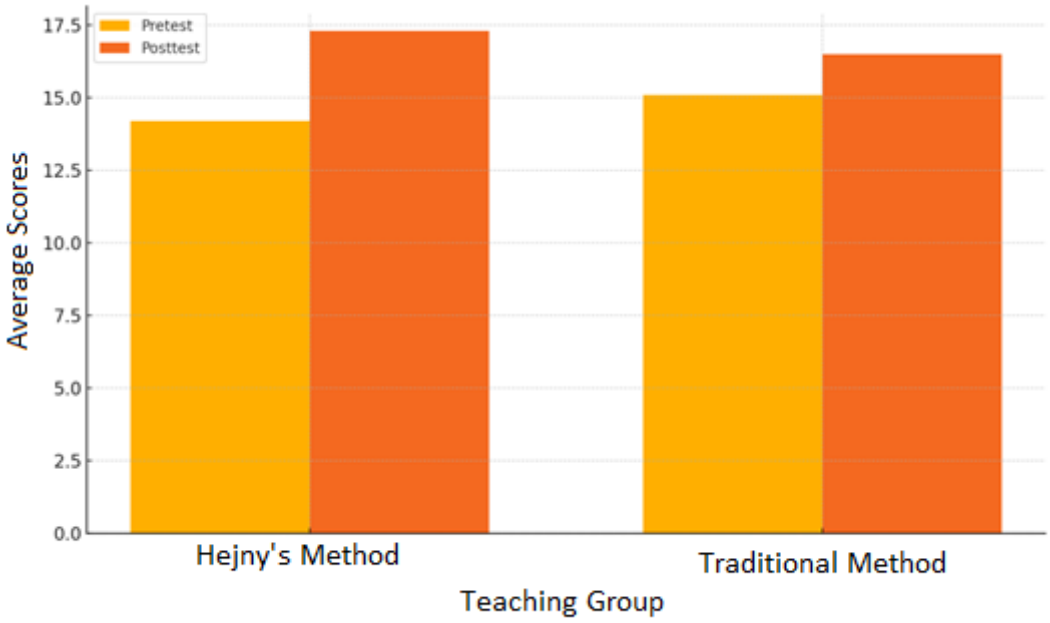


Chart 1. Comparison of Pretest and Posttest

5. Discussion

The results confirm that teaching that combines practical activities with mathematics has a positive impact not only on the cognitive but also on the motor development of children. Manipulating spatial objects, creating patterns, and solving problems based on concrete experience led to better activation of students, the development of their fine motor skills, and a deeper understanding of mathematical concepts.

Motivation is also an important factor: students showed greater engagement, perseverance, and cooperation during practical activities. The results are consistent with research that emphasizes the importance of multisensory learning and active student engagement (Bednářová, 2022; Saccà, 2024). Appropriately structured practical activities can also serve as a preventive and supportive tool for students with graphomotor difficulties.

6. Conclusion

Research has shown that mathematics teaching implemented using the Hejny method, enriched with practical activities, has a significant impact on the development of fine motor skills in younger school-age students. Given that fine motor skills affect not only writing, but also spatial imagination, attention and overall school performance, its targeted development is a desirable part of teaching.

Pedagogical practice should therefore strive to systematically incorporate manipulative activities into teaching, especially in subjects such as mathematics, work activities or primary school. Interdisciplinary connections are also suitable, allowing children to learn through movement, creativity and play.

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