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RESEARCH ARTICLE

The Role Of The Concept Of Fractions In The Development Of Primary School Pupils' Mathematical Thinking

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Abstract

This study examined the role of the concept of fractions in the development of primary school pupils' thinking. In the course of the research, the impact of learning fractions on key components of thinking—students' logical reasoning skills, as well as their abilities in analytical and synthetic thinking—was analyzed. Through an experimental approach, the level of pupils' mastery of fractions, the effectiveness of solving logical tasks, and indicators of growth in overall mathematical thinking were determined. The results show that working with the concept of fractions in primary grades significantly enhances pupils' thinking abilities.

KEYWORDS

Primary education, concept of fractions, development of thinking, mathematics lesson, logical thinking.

INTRODUCTION

In today's education system, the primary school stage is crucial not only for pupils' acquisition of knowledge but also for the development of their thinking, logical reasoning, and intellectual capacity. Mathematics, in particular, is recognized as one of the leading subjects in primary education that ensures pupils' cognitive development. Through this subject, learners do not merely master working with numbers and operations; they also develop essential cognitive competencies such as analyzing problem situations, identifying cause–effect relationships, drawing logical conclusions, and consciously grasping abstract concepts.

Within the system of mathematical concepts, the concept of fractions occupies a special place because it is characterized by conceptual complexity and a multifaceted logical structure. In the process of mastering fractions, pupils begin to understand important mathematical categories such as the relationship between a whole and its parts, ratio, comparison, and measurement. This process enables them not only to perform specific mathematical operations consciously, but also to learn how to generalize phenomena, analyze quantitative relationships, and comprehend their interconnections.

At primary school age, children's thinking is predominantly concrete and image-based, and their cognitive activity is more effectively manifested when it is directly connected to real objects, images, models, and everyday life situations. Therefore, when learning material is presented through such means, conscious understanding and solid mastery of knowledge are ensured.

At the same time, the primary education stage provides the

necessary psychological and pedagogical conditions for the gradual formation of elements of abstract thinking. Pupils are guided from practical activity with real objects toward generalized conceptual representations. This process supports the development of logical thinking, the analysis of problem situations, and the formation of pupils' competencies in finding independent solutions.

Mastering the concept of fractions not only contributes to a deeper understanding of mathematical content but also serves as an effective didactic tool for developing pupils' thinking. In particular, by comparing relationships between a whole and its parts, pupils begin to form notions of relative quantities; and through comparing measures and quantities within number ranges, they develop skills of logical analysis, drawing conclusions, and making decisions. Thus, systematic work with fractions in primary grades is important not only for strengthening pupils' mathematical preparedness, but also for supporting their overall cognitive development.

The concept of fractions functions as a key didactic means in helping pupils transition from concrete, image-based thinking to abstract-logical thinking at the primary level. This is because, when learning fractions, pupils begin to comprehend fundamental mathematical relations: dividing a whole into equal parts, expressing these parts quantitatively, and comparing them with one another.

From a scientific perspective, a fraction is a mathematical concept that represents a whole divided into equal parts and expresses the quantitative ratio of these parts. In primary grades, this concept is formed mainly through everyday-life contexts. For example, the meaning of fractions is explained through practical activities such as dividing bread into equal pieces, cutting a pie into parts, or folding paper. Such a methodological approach helps pupils master the concept of fractions consciously, perceive it in connection with real life, and become prepared for abstract mathematical modeling [1].

METHODOLOGY

At the initial stage of the study, the transition from pupils' mathematical thinking based on whole numbers to the mastery of the concept of fractions was examined in detail. This process was aimed at identifying changes in learners' thinking activity and their problem-solving abilities. Within the research design, several methods were applied in combination.

First, observation and testing methods were used to compare pupils' performance before and after instruction. Learners completed tests measuring logical reasoning skills, their level of understanding of fractions, and their ability to solve practical problems. Through this approach, pupils' knowledge and skills related to working with fractions were identified step by step, and the dynamics of change were measured.

Second, in analyzing the results, analytical assessment methods were employed, and the collected data were examined in depth using statistical indicators. This approach made it possible to demonstrate clearly the changes occurring in pupils' thinking processes and to evaluate the level of success in mastering the concept of fractions.

In addition, interactive exercises were widely used as a tool for data collection. These exercises not only helped reinforce pupils' skills in working with fractions, but also activated their logical reasoning processes. Each mathematical task solution and its logical justification were analyzed in written form; errors in the thinking process and ways to eliminate them were identified.

As a result, this methodological approach ensured deeper understanding of the concept of fractions and enabled the systematic identification of changes in key components of thinking.

The issue of forming the concept of fractions in primary mathematics education has in recent years been regarded as one of the important directions of pedagogical research. In particular, the role of part–whole and fraction concepts in pupils' cognitive development, the methodology of teaching them, and their practical effectiveness have been studied in depth by many researchers.

In her research, N. R. Yadgarova pays special attention to the teaching of part–whole and fraction concepts in primary mathematics lessons. The author substantiates the importance of using visual aids, concrete models, and real-life examples in forming an understanding of fractions. She also provides a scholarly explanation of how the concept of fractions supports the development of pupils' abilities to understand part–whole relationships, compare quantities, and generalize. According to Yadgarova's conclusions, working with fractions has a positive influence on the development of primary pupils' thinking and helps them consciously master mathematical concepts [3].

Similarly, in the research conducted by O. K. Odilova, H. Eshonqulova, and D. N. Xayrullayeva, modern pedagogical

approaches to teaching part–whole and fraction concepts in primary grades are analyzed. The authors emphasize that interactive methods, problem-based situations, and activities grounded in pupils' independent work play an important role in teaching fractions. Their findings indicate that such approaches develop not only pupils' mathematical knowledge, but also their logical and critical thinking. The authors also underline the necessity of taking into account pupils' age-related and psychological characteristics in the process of teaching the concept of fractions [4].

Thus, the reviewed literature confirms that the concept of fractions is an important pedagogical factor in the development of primary school pupils' thinking. These scholarly perspectives serve as a theoretical foundation for the present study and demonstrate the need to improve the methodology of teaching fractions.

RESULTS AND DISCUSSION

Introducing the concept of fractions into the primary education process contributes significantly to the development of pupils' cognitive potential. Research shows that learning fractions not only enhances mathematical abilities but also strengthens logical and abstract thinking. By studying fractions, pupils learn to relate the notions of a whole and its parts, which expands the scope of their mathematical reasoning and fosters skills for solving problems systematically.

Moreover, methodological approaches and the use of interactive tools make the teaching of fractions more effective. For instance, diagrams, visual models, demonstrative exercises, and practical tasks help pupils understand fractions not only theoretically but also in applied forms. These pedagogical tools activate thinking processes, support concentration, and increase learners' interest in the topic.

In addition, the results highlight the importance for primary school teachers of applying modern pedagogical approaches in teaching fractions and adapting lessons to pupils' individual characteristics. Paying attention to each pupil's abilities and learning pace, enriching lessons with interactive and visual methods, and designing the learning process in an engaging manner increase overall effectiveness. In this way, learning the concept of fractions was found to support the development of multiple aspects of pupils' thinking, strengthen logical and mathematical reasoning, and form practical skills.

The process of learning fractions contributes to the development of various thinking skills. Specifically, it develops analytical thinking, as pupils divide a whole into parts and analyze each part separately. At the same time, synthetic thinking is reinforced: pupils learn to recombine separate parts and perceive them as a whole. This increases their ability to comprehend complex mathematical concepts.

Working with fractions also develops comparison skills. For example, by comparing different fractions, pupils learn to draw logical conclusions and answer questions such as "Which fraction is larger?" or "Can two fractions be equal?" This process encourages active participation and supports the development of independent thinking.

Furthermore, operations performed with fractions—addition, subtraction, division into parts, and comparison—help pupils understand logical sequences and apply them in practice. For instance, when adding or subtracting two fractions, pupils learn to find a solution step by step, explain the result, and justify their conclusions.

As a result, the concept of fractions not only strengthens mathematical knowledge, but also forms pupils' abilities to express ideas systematically, reason logically, and make decisions. At the same time, it develops practical skills such as calculating and comparing in real-life situations, which is an important means of deepening mathematical thinking in primary education.

In teaching the topic of fractions in primary grades, the use of visual teaching aids is of particular importance. Explaining fractions through pictorial materials, various diagrams, geometric figures, and real objects helps pupils understand the topic more quickly and ensures stable learning outcomes.

It should also be noted that practical activities—dividing paper into equal parts, partitioning shapes, or representing fractions through colors—enhance pupils' interest in the learning process and activate their thinking. These types of activities support pupils in drawing independent conclusions, analyzing situations, and developing creative approaches.

The process of learning fractions develops not only pupils' mathematical thinking but also their general intellectual capacity. This creates a strong foundation for mastering more complex knowledge at subsequent stages of education [6].

CONCLUSION

The concept of fractions is an important pedagogical tool in

developing primary school pupils' thinking. Along with shaping logical reasoning, it plays a major role in developing analytical and abstract thinking skills. While working with fractions, pupils learn to understand part–whole relationships, analyze ratios between numbers, and connect complex situations. Through this, they gain a deeper understanding of mathematical concepts and develop skills to apply them independently in practice.

Teaching the concept of fractions on a sound methodological basis significantly increases pupils' level of achievement. For this purpose, visual aids—pictures, diagrams, geometric shapes, and concrete models—should be actively used. At the same time, practical activities—such as dividing paper into equal parts, coloring shapes, and separating objects into pieces—raise pupils' interest in learning and activate their thinking.

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