

GENERAL ISSUES OF THE METHODOLOGY OF TEACHING NON-NEGATIVE INTEGERS NUMBERING IN PRIMARY SCHOOLS

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<https://doi.org/10.5281/zenodo.22938050>**Abstract**

This article discusses the general methodological issues of teaching non-negative integers numbering in primary schools. The study examines the content, objectives, principles, methods, and organizational forms of teaching pupils to read, write, compare, and sequence non-negative integers. Particular attention is paid to the formation of pupils' understanding of numbers, digits, the natural number sequence, place value, and relationships between numbers. The article emphasizes the importance of using visual aids, practical activities, didactic games, interactive methods, and information technologies in the teaching process. It is argued that systematic and age-appropriate instruction helps pupils develop mathematical thinking, logical reasoning, independent learning skills, and mathematical communication. The study also highlights the importance of moving from concrete objects and practical activities to abstract mathematical concepts when teaching numbering.

Keywords: primary education, mathematics education, non-negative integers, numbering, numbers, digits, natural number sequence, place value, mathematical thinking, teaching methodology, didactic games.

Introduction

Mathematics education in primary school plays an important role in developing pupils' logical thinking, analytical abilities, and practical skills. One of the fundamental components of primary mathematics education is teaching pupils to understand and use numbers. In this regard, the methodology of teaching the numbering of non-negative integers has particular importance because pupils' initial knowledge of numbers serves as a basis for mastering arithmetic operations and other mathematical concepts.

The concept of number is formed gradually through pupils' practical activities. At the initial stage, pupils count concrete objects, determine their quantity, compare groups of objects, and gradually associate quantities with corresponding numbers. Therefore, teaching numbering should not be limited to memorizing numbers and their names. Pupils should understand the meaning of numbers, their sequence, their position in the number line, and their relationships with other numbers.

M.E. Jumayev and Z.G. Tadjiyeva emphasize the importance of systematic and gradual formation of mathematical concepts in primary mathematics education [3]. In particular, teaching pupils to understand numbers and their relationships creates the necessary foundation for further mathematical learning.

The Concept of Non-Negative Integers and Numbering

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Non-negative integers include zero and all positive integers. In primary mathematics education, pupils gradually become familiar with these numbers through counting, comparison, reading, writing, and practical activities.

Numbering can be understood as a system and process through which numbers are named, read, written, ordered, compared, and used to represent quantities and positions. Mastering numbering enables pupils to develop several important mathematical skills.

Through numbering activities, pupils learn:

- to read and write numbers correctly;
- to identify the sequence of numbers;
- to determine the number that comes before or after a given number;
- to compare numbers;
- to identify the composition of numbers;
- to understand place-value relationships;
- to arrange numbers in ascending and descending order;
- to use numbers in practical and everyday situations.

Thus, teaching numbering is one of the fundamental components of primary mathematics education and provides a basis for learning arithmetic operations.

Objectives of Teaching Non-Negative Integers Numbering

The main objective of teaching non-negative integers numbering is to develop pupils' meaningful and systematic understanding of numbers and their relationships.

The main objectives include the following:

First, pupils should develop an understanding of numbers and digits. They need to recognize that a number represents a quantity, while a digit is a symbol used to represent numbers in written form.

Second, pupils should understand the sequence of numbers. They should be able to identify the preceding and following numbers and continue a given number sequence.

Third, pupils should develop the ability to read and write numbers. This includes recognizing digits, combining digits to form numbers, and understanding the structure of numbers.

Fourth, pupils should learn to compare numbers using the concepts of greater than, less than, and equal to.

Fifth, pupils should understand the composition of numbers. For example, the number 8 can be represented as $5 + 3$, $6 + 2$, $7 + 1$, and other combinations.

Sixth, pupils should develop mathematical language and communication. They should be able to name numbers correctly, read mathematical symbols, and explain their reasoning using appropriate mathematical terminology.

Stages of Teaching Numbering

Teaching non-negative integers numbering in primary school should be organized gradually and systematically.

At the first stage, pupils work with concrete objects. For example, a teacher may place five pencils on a table and ask pupils to count them. After determining that there are five objects, the teacher introduces the written symbol "5". This approach helps pupils understand the connection between a quantity, a number, and its written representation.

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At the second stage, pupils work with number sequences. They may be asked to continue sequences such as:

1, 2, 3, 4, 5, ...

or identify missing numbers:

1, 2, __, 4, 5, __, 7.

Such exercises help pupils understand the order and continuity of numbers.

At the next stage, pupils learn to compare numbers. For example:

$7 > 5$

$3 < 8$

$6 = 6$

These activities develop pupils' understanding of quantitative relationships.

Gradually, pupils also learn to determine the position of a number on a number line and identify its neighboring numbers. This strengthens their understanding of numerical sequence and prepares them for arithmetic operations.

Teaching Place Value

Understanding place value is an essential part of teaching numbering. Pupils gradually learn about ones, tens, hundreds, and other place-value units.

For example, the number **24** consists of 2 tens and 4 ones:

$24 = 2 \text{ tens} + 4 \text{ ones}$.

Similarly:

$35 = 3 \text{ tens} + 5 \text{ ones}$.

$126 = 1 \text{ hundred} + 2 \text{ tens} + 6 \text{ ones}$.

Practical activities with counting sticks, blocks, cards, and other manipulatives can help pupils understand that ten ones make one ten and ten tens make one hundred.

The systematic teaching of place value enables pupils not only to read and write numbers but also to understand their internal structure. This knowledge is particularly important for performing addition, subtraction, multiplication, and division.

The Role of Visual Aids in Teaching Numbering

Primary school pupils learn mathematical concepts more effectively when abstract ideas are connected with concrete objects and visual representations. Therefore, visual aids are particularly important when teaching non-negative integers.

Teachers can use:

- counting sticks;
- number cards;
- pictures of objects;
- number lines;
- tables;
- geometric figures;
- cubes and blocks;
- interactive boards;
- digital presentations.

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For example, a teacher may show eight apples and ask pupils to count them. The teacher then presents the digit “8”. Through this activity, pupils establish a connection between the quantity of objects and its numerical representation.

M.E. Jumayev notes the importance of practical activities in the formation of mathematical concepts [4]. Moving from concrete objects to visual representations and then to abstract mathematical symbols makes the learning process more accessible to young pupils.

Interactive Methods and Didactic Games

Modern primary education increasingly uses interactive teaching methods to improve pupils' engagement and learning outcomes. Numbering can be taught through various games and interactive activities.

For example, in the “Find the Number” game, pupils identify missing numbers:

1, 2, __, 4, 5, __, 7, 8, __, 10.

In the “Find the Neighbor” activity, pupils identify the numbers immediately before and after a given number. For example, the neighbors of 6 are 5 and 7.

In the “Arrange the Numbers” activity, pupils receive several number cards and are asked to arrange them in ascending or descending order.

The “Compare the Numbers” activity can be used to reinforce the symbols $>$, $<$, and $=$.

Such activities make the learning process more engaging and encourage pupils to participate actively. They also support the development of logical thinking, attention, memory, and mathematical communication.

Use of Information Technologies

Information and communication technologies can also contribute to effective teaching of numbering in primary school. Interactive presentations, educational applications, digital games, online exercises, animations, and electronic tests can make mathematical concepts more understandable and engaging.

For example, an interactive board can display a sequence of numbers with several missing elements. Pupils can select the appropriate numbers and place them in the correct positions. Similarly, pictures showing different quantities of objects can be presented, and pupils can choose the corresponding number.

Information technologies can provide several educational benefits:

- increasing pupils' interest in mathematics;
- presenting mathematical concepts visually;
- providing immediate feedback;
- supporting individual learning;
- enabling repeated practice;
- identifying pupils' learning difficulties;
- increasing pupils' independent learning activities.

However, technology should be used purposefully. Digital tools should support the achievement of educational objectives rather than replace direct interaction, practical activities, and teacher guidance.

Research Methodology

The methodology of teaching non-negative integers numbering can be investigated through pedagogical observation, interviews, analysis of pupils' written and practical work, comparative analysis, and pedagogical experimentation.

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During the learning process, pupils' abilities can be assessed according to several indicators:

1. ability to read and write numbers;
2. ability to continue a number sequence;
3. ability to identify neighboring numbers;
4. ability to compare numbers;
5. ability to determine place value;
6. ability to identify the composition of numbers;
7. ability to arrange numbers in ascending and descending order;
8. ability to apply numbers in practical situations.

The following tasks can be used to assess pupils' knowledge:

1. Write the numbers from 1 to 20 in order.
2. Identify the numbers before and after 7.
3. Compare 5 and 8.
4. Represent 9 as the sum of two different numbers.
5. Identify the tens and ones in 14.
6. Complete the sequence: 11, 12, __, 14, __, 16.
7. Arrange the numbers 6, 2, 9, 4, and 7 in ascending order.
8. Arrange the numbers 3, 8, 1, 6, and 5 in descending order.

These tasks can be used to determine the extent to which pupils have mastered the basic concepts of numbering.

Discussion and Results

The effectiveness of teaching non-negative integers numbering depends largely on the appropriate selection and combination of teaching methods. Simply asking pupils to memorize numbers is not sufficient. Pupils should have opportunities to count objects, compare quantities, arrange numbers, identify numerical relationships, and explain their reasoning.

Individual differences among pupils should also be considered. Some pupils may quickly recognize and write numbers, while others may require additional visual materials, repeated practice, or practical activities. Therefore, differentiated instruction can be effectively incorporated into numbering lessons.

The combination of visual materials, practical activities, didactic games, interactive methods, and information technologies can increase pupils' engagement and support the development of mathematical thinking.

Conclusion

Teaching non-negative integers numbering is an essential component of primary mathematics education. It provides pupils with fundamental knowledge about numbers, digits, numerical sequences, place value, and relationships between numbers.

The effectiveness of this process depends on systematic instruction, age-appropriate methods, practical activities, and the effective use of visual materials. Teachers should gradually move from concrete objects to visual representations and finally to abstract mathematical symbols.

Interactive methods and didactic games can make numbering lessons more engaging and support pupils' active participation. Information technologies can additionally provide opportunities for visualization, independent practice, immediate feedback, and differentiated learning.

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Therefore, teaching non-negative integers numbering should be considered not merely as teaching pupils to read and write numbers, but as a process of developing the foundations of mathematical thinking, logical reasoning, mathematical communication, and practical problem-solving skills.

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