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PROBLEMS OF SPACE AND TIME IN MATHEMATICS FOR PRIMARY SCHOOL STUDENTS

The aim of organizing the educational process in elementary school is to develop in younger students the ability to assimilate commonly accepted knowledge, skills, and abilities that will be useful to them in everyday life. Proper assimilation of these components of learning is impossible without considering their concepts of space and time, as these notions are of significant importance for the successful educational activities of students, including their ability to write, calculate, and solve mathematical problems, as well as in their daily lives. Understanding the concepts of time and space is considered one of the key aspects of education in elementary school. Today, the task of teachers is to develop methodological approaches that will facilitate the formation of students' ideas about time and their orientation in it during the study of mathematics.

Researchers V. Kovalyuk and N. Listopad have studied the process of forming children's ideas about time and their orientation in time [1], [2]. An important part of forming these concepts involves children performing actions with named numbers and developing the corresponding skills. This aspect has also been studied by A.V. Tikhonenko A. V., Sarienکو V. K. [3].

Understanding the concepts of space and time in mathematics is essential for the development of elementary school students' cognitive skills and their preparation for further mathematical and scientific education [4], [5].

The purpose of this article is to elucidate the fundamental aspects and peculiarities of space and time in the mathematical education of elementary school students.

Spatial awareness is the recognition of one's own body in space and the relative position of objects around it. It involves understanding and remembering the location and orientation of objects in relation to oneself. Learning about space in mathematics helps children understand and navigate the physical world around them. It includes concepts like shapes, sizes, patterns, and spatial relationships. Good spatial awareness is linked to success in subjects like mathematics (geometry, problem-solving), science (understanding physical phenomena), and arts (visual arts, architecture). It also aids in the development of motor skills and is crucial for everyday tasks such as navigating spaces and organizing objects. This awareness is essential for everyday tasks and is also a precursor to understanding more complex geometric concepts later in life.

Time is a fundamental concept that helps children organize events in a sequential manner. Understanding time involves learning about hours, minutes, days, weeks, months, and years. It also includes grasping the idea of past, present, and future. This understanding is crucial for time management, planning, and the comprehension of historical and future events. Temporal understanding is essential for planning,

organizing activities, understanding history, and comprehending narratives. It also plays a role in mathematical concepts like duration and sequencing, and is critical for developing time management skills. Understanding by students of concepts related to time, such as orientation during the day based on natural phenomena, notions of cause-and-effect relationships in rhythmic natural occurrences, awareness of the duration of seconds, minutes, and hours, skills in reading time from a clock, and assessing time intervals, constitutes the comprehensive understanding of time for elementary school students. The study of this concept is considered challenging due to its abstract nature and the absence of tangible objects for representation. Time cannot be stopped or rewound, making the comparison of time intervals and events a complex task.

As a result of systematic work, students develop certain ideas about the properties of time: time is not subject to slowing down or speeding up; time always moves forward and cannot be turned back.

The particularities of acquiring skills to distinguish parts of the day and name them in the correct sequence include:

Students typically focus on those parts of the day that they perceive from adults or during which they perform specific activities. They determine parts of the day starting in the morning (when they wake up). There may be some discrepancies in the mastery of the names of the parts of the day.

It is important for teachers to take these specificities into account and utilize teaching methods that help students better understand and consolidate their knowledge of time.

The problem of space and time in mathematics for elementary school students can arise due to several key factors. Let's consider some of them and ways to address them:

Abstraction: The concepts of space and time can be abstract and challenging for young children. To address this issue, it's crucial to use concrete examples, graphical representations, and games that help children grasp these concepts.

Low Development of Thinking: Children in elementary school have not yet fully developed high-level abstract thinking. It is essential to use activity-based methodology and practical tasks to help them learn basic concepts of time and space.

Real-Life Relevance: Tasks and examples should be connected to students' real-life experiences. For example, use the concept of time to discuss daily routines or space to explore places in their immediate environment.

Application of Geometry: Elementary school students may struggle with understanding concepts related to geometry, such as point, line, straight line, angle, and more. It's important to start with simple concepts and gradually progress to more complex ones.

Individualized Approach: Each student may have unique needs and learning paces. Teachers should create individualized programs and assignments for students who require additional support or further development.

Utilization of Visualization: Using drawings, diagrams, models, and other visual aids can significantly facilitate the understanding of space and time concepts.

Games and Interactive Teaching Methods: Using educational games and interactive methods can make the learning process more engaging and effective for children.

Both space and time concepts in mathematics involve problem-solving. Whether it's figuring out the shortest route between two points (spatial problem-solving) or determining the duration of an event (temporal problem-solving), these skills are critical in both academic and real-life contexts. Spatial learning, in particular, enhances visualization skills. Concepts of space and time are not limited to mathematics. They intersect with subjects like science (e.g., understanding the solar system), geography (e.g., reading maps), and history (e.g., timelines). This interdisciplinarity aids in the holistic development of a child. Engaging with spatial and temporal problems can improve cognitive flexibility – the ability to adapt thinking and behavior to new, changing, or unexpected events. This skill is essential for adaptability and creativity.

In conclusion, it is crucial to create a structured and engaging learning program that promotes the development of elementary students' understanding of space and time concepts. Understanding these concepts is a crucial step in mathematical education and the development of children's general cognitive skills. Incorporating activities and lessons that focus on space and time in elementary education not only strengthens mathematical understanding but also supports overall cognitive development, preparing students for more complex academic tasks and real-world challenges.

The study of space and time in mathematics for elementary school students revealed that this topic is important not only for the development of mathematical skills, but also for the development of critical thinking and the ability to analyze information. Time is one of the most important and complex quantities. Children's knowledge of time and space is acquired very slowly through prolonged observation, the study of other concepts, and life experience. During mathematics lessons, when the concept of time is being taught, it is recommended to adhere to the principle of clarity. Use various tables, diagrams, clocks, stopwatches, timers, and other tools. Make lessons interesting by sharing fun facts about time in plants and animals, using didactic games, mental exercises, and preparing various exercises and non-standard tasks.

Further research in the field of the problem aspects of space and time in mathematics for elementary school students can focus on the development and implementation of innovative teaching methods that facilitate a better understanding of these important concepts, as well as studying their impact on the overall mathematical development of students.

REFERENCES

1. Ковальчук В. Формування часових уявлень учнів початкових класів: метод. посіб. / В. Ковальчук, Л. Силюга, Л. Білецька. – Дрогобич : Коло, 2018. – 51 с.
2. Листопад Н. Вивчення величин на уроках математики в початковій школі на засадах компетентнісного підходу / [Електронне видання]: методичні рекомендації./ Н.П. Листопад – Київ: Педагогічна думка, 2020 –72 с.
3. Тихоненко А. В., Сарієнко В. К. Величини у початковій школі : навч.-метод. посібник / В. К. Сарієнко. – Слов'янськ, 2019 – 152 с.
4. Голота Н. Особливості пізнання дитиною простору й часу в шкільному віці / Голота Н.: Науковий вісник Миколаївського нац. універ. ім. В. О. Сухомлинського. К. : Педагогічні науки. – 2016. – № 2. – 38–44 с.

5. Скворцова С.О. Нова українська школа: методика навчання математики у 3 – 4 класах закладів загальної середньої освіти на засадах інтегративного і компетентнісного підходів : навч. – метод. посіб. / Світлана Скворцова, Оксана Онопрієнко. – Харків : Вид-во «Ранок», 2020. – 320с.