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METHODOLOGY OF TEACHING ARITHMETIC OPERATIONS WITH MULTI-DIGIT NUMBERS IN PRIMARY EDUCATION.

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Abstract: This article analyzes the significance of using innovative pedagogical technologies in teaching arithmetic operations within the multi-digit number concentration of primary education. In modern educational settings, interactive methods, information and communication technologies, gamification, the STEAM approach, and project-based learning methods play a crucial role in developing students' mathematical thinking and enhancing learning effectiveness. As part of the study, the impact of these methods on the educational process was examined using empirical methods, and based on the obtained results, recommendations for the effective implementation of innovative technologies were developed. A comparative analysis was conducted between the experimental and control groups, which established that the application of innovative pedagogical technologies significantly improves the development of students' logical thinking abilities and mathematical competencies. The results of this research provide an important scientific and practical foundation for improving primary education and widely implementing modern pedagogical approaches.

Keywords: Primary education, multi-digit numbers, arithmetic operations, innovative pedagogical technologies, interactive methods, gamification, STEAM approach, digital technologies, mathematics education, educational process, learning effectiveness, project-based learning.

Introduction

Increasing the effectiveness of mathematics teaching in modern educational processes is one of the crucial issues. Particularly in primary grades, the process of teaching arithmetic operations with multi-digit numbers plays a vital role in developing students' future mathematical literacy and logical thinking skills. At this stage, implementing innovative pedagogical technologies to enhance students' comprehension and motivation is one of the urgent tasks.

Traditional teaching methods are usually based on mechanical repetition and standard approaches, which only serve to develop students' memorization and rote learning abilities. However, one of the main objectives of the 21st-century education system is to foster students' independent thinking, analytical approach, and creative problem-solving skills. Therefore, innovative pedagogical technologies - including interactive methods, information and communication technologies, digital learning tools, and game-based approaches - help primary school students grasp mathematical concepts more deeply.

Studies show that the use of visualization and interactive methods in lessons significantly improves students' understanding and application of mathematical knowledge. In particular, approaches such as gamification, modular learning,

project-based education, and STEAM (Science, Technology, Engineering, Arts, Mathematics) are effective in increasing children's interest and engaging them in active participation.

This article analyzes the role of innovative pedagogical technologies in teaching arithmetic operations with multi-digit numbers in primary grades. Based on research methods and results, the advantages of innovative approaches and their impact on the educational process are highlighted. Drawing from best practices and scientific sources on this topic, proposals are put forward for the practical implementation of innovative methods.

Literature analysis and methodology

Numerous scientific studies have been conducted on the application of innovative pedagogical technologies in mathematics education. In particular, R. Ishmukhamedov emphasizes the importance of interactive teaching and collaborative learning in the cognitive development of students [5]. Additionally, M.H. Sobirov advocated for the importance of experiential learning in developing students' logical thinking abilities [8: pp. 81-84].

There are also several international and local studies on innovative pedagogical technologies. For example, the cognitive learning theory proposed by G. Ismanova substantiates the importance of interactive teaching and experiential learning.

Cube method.

Using the cube method during lesson consolidation yields good results. Step 1: After the topic is covered, students form a concept. It is suggested to write the formed concept as follows:

1. Describe;
2. Compare;
3. Relate;
4. Analyze;
5. Apply;
6. Pros and cons [6: pp. 149-153].

Results based on methodological approaches showed that applying innovative technologies in primary grades significantly impacts the improvement of students' mathematical competencies. Using these approaches, practical recommendations have been developed to enhance educational effectiveness.

A broader analysis of literature and methodological approaches serves to strengthen the scientific foundations of this topic. The results of this study are expected to create an important basis for developing mathematics education in primary grades.

In the methodology of teaching arithmetic operations with multi-digit numbers, addition and subtraction are taught simultaneously using oral and written

methods. In the primary school mathematics textbook, addition and subtraction cases are introduced progressively from simple to complex. At this stage, students develop calculation skills primarily in column form, addressing addition and subtraction across place value units, calculations with numbers containing zeros, and operations with numbers representing quantities [1: p. 296].

In connection with the addition and subtraction of multi-digit unnamed numbers, work is carried out on the addition and subtraction of named numbers expressed in units of length, mass, time, and value.

For example: 42 m 65 cm + 26 m 63 cm = 69 m 48 cm

+42 m 65 cm +4265

26 m 83 cm 2683

69 m 48 cm 6948 cm 69 m 48 cm.

Problem. A factory had 6 tons of flour. 2265 kg of flour were sent to the first supermarket, and 375 kg more to the second. How many kilograms of flour are left at the factory? (Express the ton in kilograms.)

Solution: 1 t = 1000 kg, therefore, 6 x 1000 = 6000 kg

1) 2265 kg + 375 kg = 2640 kg

2) 2265 kg + 2640 kg = 4905 kg

3) 6000 kg - 4905 kg = 1095 kg

Answer: 1095 kilograms of flour remained at the factory.

Teaching multiplication and division of multi-digit numbers to students is divided into three stages.

In the first stage, multiplication and division by a single-digit number are taught.

In the second stage, multiplication and division by place values are taught.

In the third stage, multiplication and division by two-digit and three-digit numbers are taught.

ANALYSIS AND RESULTS

Problem. Nargiza bought 2 kg of potatoes for 5000 soums and cabbage for 2500 soums. She gave the seller 15,000 soums. How much change should Nargiza get?

Solution: Method 1. 15000- (5000x2) -2500=15000-10000-2500=2500

Method 2. 1) 5000x2=10000

2) 10000+2500=12500

3) 15000-12500=2500

Answer: The buyer should receive 2500 soums in change.

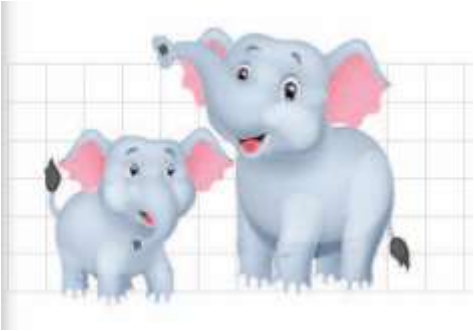
Practical tasks are given to find unknown numbers.

If we add an unknown addend to the number 645, we get the number 929. Find the unknown addend.

Solution: 645+x=929

x=929-645
x=284
Check: 645+284=929, 929=929

If 408 is subtracted from an unknown number, the result is 567. Find the unknown minuend.
Solution: x-408=567
x=567+408
x=975
Check: 975-408=567, 567=567
The following examples are given in the section on multi-digit numbers [3: p. 162].
Problem 1. The weight of 3 elephants is 4241 kilograms. If the mother elephant weighs 1815 kilograms, find the mass of the baby elephants.



Solution: 4241 - 1815 = 2426
2426: 2 = 1213
Answer: The weight of each elephant calf is 1213 kilograms.

Problem 2. Elchin participated in a cycling tournament. The total distance to be covered by bicycle is 3240 meters. Elchin has already traveled 1264 meters. How much more distance does he need to cover? [4: P. 83-87].
Solution: 3240 - 1264 = 1976
Answer: Elchin needs to cover another 1976 meters.

Problem 3. A rabbit jumps 34 cm in one leap, while a frog jumps 18 cm. If they both start jumping from the same point in the same direction, what will be the distance between them after the 8th jump?

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Solution: 34x8=272
18x8=144
272-144=128
Answer: The distance between the rabbit and the frog is 128 cm.

Problem 4. Based on the prices of the clothes shown below, calculate the total value of the requested items and write the result in a column format.

178000 272000 113000 125000 76000

178000+76000=254000

272000+125000=397000

113000+178000=291000

Problem 6. One cow gives 12 liters of milk per day. Yulduz sells milk for 8,000 soums per liter, and Yulduz has 8 cows at home. How much does Yulduz earn per month? [3: p. 162].

Discussion

The use of innovative pedagogical technologies in teaching arithmetic operations with multi-digit numbers in primary education not only increases the effectiveness of education but also contributes to the development of students' logical thinking and independent learning abilities. Research results showed that

students taught using digital technologies and interactive methods achieved significantly better results than their peers taught using traditional methods.

Additionally, the use of gamification and game-based approaches increased student engagement during lessons and fostered positive learning motivation. Assigning independent tasks during lessons using adapted educational platforms and digital resources developed students' ability to work independently.

Studies have shown that teaching mathematical concepts through visual and practical exercises using the STEAM approach significantly increases effectiveness. It is important to use project-based learning methods to enable students to independently solve problems and develop scientific research skills.

However, for the successful implementation of innovative technologies, teachers' proficiency in modern methods is also crucial. The study revealed that some teachers experienced difficulties in using information and communication technologies. Therefore, improving teachers' professional qualifications and preparing them for modern educational technologies remains a priority task.

Conclusion

The use of innovative pedagogical technologies in teaching arithmetic operations with multi-digit numbers in primary education serves not only to increase the effectiveness of the educational process but also to develop students' mathematical competencies. The research results showed that interactive methods, digital technologies, gamification, and STEAM approaches increase students' interest in the learning process and develop their independent thinking skills.

The following recommendations are proposed for the widespread implementation of innovative pedagogical technologies:

1. Develop and implement special training programs for teachers - regularly organize training sessions and seminars for teachers to master modern pedagogical technologies.
2. Increase the use of gamification and interactive methods in primary grades - employ game-based approaches to enhance student engagement and make lessons more interesting.
3. Extensively use digital technologies and multimedia tools - facilitate the understanding of complex topics using visualization and interactive teaching methods.
4. Update curricula based on the STEAM methodology - bring mathematics closer to practical applications by connecting it with other disciplines.

These approaches serve to improve the quality of education in primary grades and strengthen students' mathematical competencies. In the future, it will be possible to further enhance the effectiveness of innovative approaches in the education system by conducting more extensive research on this topic.

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