

#### ISSN 2581-5148

Vol. 8, Issue.3, May-June 2025, page no. 95-106

To cite this article: Dr. Bich Tran Ngoc, Anh Le Thi, Anh Kim Thi Hong, Giang Le Huong, Hien Le Ngan and Linh Nguyen Khanh (2025). DESIGNING AND USING REALISTIC MATHEMATICAL PROBLEMS IN TEACHING NATURAL NUMBERS AND CALCULATIONS WITH NATURAL NUMBERS FOR VIETNAMESE ELEMENTARY SCHOOL STUDENTS, International Journal of Education and Social Science Research (IJESSR) 8 (3): 95-106 Article No. 1069, Sub Id 1666

# DESIGNING AND USING REALISTIC MATHEMATICAL PROBLEMS IN TEACHING NATURAL NUMBERS AND CALCULATIONS WITH NATURAL NUMBERS FOR VIETNAMESE ELEMENTARY SCHOOL STUDENTS

Dr. Bich Tran Ngoc<sup>1</sup>, Anh Le Thi<sup>2</sup>, Anh Kim Thi Hong<sup>3</sup>, Giang Le Huong<sup>4</sup>, Hien Le Ngan<sup>5</sup> and Linh Nguyen Khanh<sup>6</sup>

<sup>1</sup>University of Education - Thai Nguyen University <sup>2,3,4,5,6</sup>Students of the faculty of elementary Education, University of Education, Thai Nguyen University.

DOI: https://doi.org/10.37500/IJESSR.2025.8308

#### ABSTRACT

Mathematics has more and more applications in real life. The 2018 General Education Mathematics Program of Vietnam not only provides students with knowledge and skills but also creates opportunities for students to apply mathematics to solve practical problems accurately and flexibly. Therefore, in teaching Mathematics in general, teaching Natural Numbers and calculations with natural numbers in primary school in particular, it is necessary to create opportunities for students to apply mathematical knowledge and skills to solve practical situations. This paper proposes a process for designing and using practical problems in teaching Natural Numbers and calculations with natural numbers for primary school students in Vietnam. At the same time, the article provides an example to illustrate the proposed process.

**KEYWORDS**: elementary math, elementary school, real math problem, elementary school students, natural number.

#### 1. INTRODUCTION

In the Netherlands, between 1968 and 1971, the Freudenthal Institute developed a new approach to mathematics's education known as Realistic Mathematics Education (RME). According to Hans Freudenthal (1971): "Mathematics as a human activity" [7]. And the author also argues (1968): "Mathematics is not a mass of mathematical knowledge, but the activity of solving problems and searching for problems, and more broadly the activity of organizing elements from reality or mathematical elements - 'Mathematization'" [6].

Along with the promotion and development of mathematics education in a new direction, many other researchers in the world have also expressed their views on "Realistic Mathematics Education," notably Marja van den Heuvel-Panhuizen and Paul Drijvers (2020), who stated that: "Realistic Mathematics Education (or mathematics education linked to practice) - is a specific teaching theory



ISSN 2581-5148

Vol. 8, Issue.3, May-June 2025, p no. 95-106

for mathematics, developed in the Netherlands. A characteristic of realistic mathematics education is the inclusion of rich, 'practical' situations in a prominent position in the learning process. These situations act as a starting point for the development of mathematical concepts, tools and processes, and as a context" [8].

"People are often drawn to the thought process that arises from real-life situations. Therefore, applying a teaching method closely linked to practice is considered an effective way to create joy and excitement in learning, while also sparking a passion for exploring knowledge. This method not only develops logical thinking, but also enhances students' problem-solving abilities and awareness, preparing them for the skills and qualities needed in modern workers.

In Vietnam, "Mathematics education linked to practice" is still a new concept, with not much research. However, some researchers have applied the theory of mathematics education linked to practice in experiments at some high schools and have obtained the following results:

Author Nguyen Tien Trung and colleagues (2019) applied the theory of mathematics education linked to practice in teaching Mathematics and suggested 5 principles as follows: "using context, using models, using self-built products of students, the principle of interaction and integration in learning" [5].

Nguyen Danh Nam (2019) believes that "Mathematics education linked to practice is a positive approach in teaching Mathematics according to the orientation of the new general education program and contributes to linking mathematical knowledge in schools with practice" [3].

Le Thuy Trang and colleagues (2021) suggested a few orientations for applying the perspective of realistic mathematics education for students as follows: "Teaching in context and by context; Problem-solving teaching in mathematics teaching; Focusing on the experience of individual students, especially the practical experience should be valued; Encouraging, guiding, and supporting students to explain, reflect, and think critically in learning mathematics; ..." [4].

# 2. THEORETICAL BACKGROUND

# 2.1. Realistic mathematical problem

Realistic problems are problems that use real-life language and situations, allowing students to apply their existing knowledge and resources to solve mathematical problems at different levels" [2].

Realistic mathematical problem plays an important role in creating opportunities for students to develop abilities and qualities. Designing realistic mathematical problem in teaching Mathematics provides opportunities for students to develop problem-solving skills and other competencies specified in the program.



Vol. 8, Issue.3, May-June 2025, p no. 95-106

Realistic mathematical problems contain information with real-life elements, requiring students to select and apply mathematical knowledge to solve them. When solving realistic mathematical problem, students have the opportunity to apply mathematical knowledge to solve problems in life. Solving realistic mathematical problems not only helps students see the relevance of mathematics in their lives, but also fosters a love for the subject.

Solving realistic mathematical problems bridges the gap between theory and practice, helping students understand the real-life applications of mathematics and deepening their understanding of mathematical concepts.

# 2.2. Elementary School Mathematics Curriculum in Vietnam

Vietnam's general education Mathematics program was promulgated with Circular No. 32/2018/TT-BGDDT on December 26, 2018 by the Minister of Education and Training [1]. The program focuses on applicability and links with modern economic, scientific, and social developments, as well as global issues.

The elementary school Mathematics program (grades 1-5) includes three content strands: Numbers and Calculations, Geometry and Measurement, and Some Elements of Statistics and Probability. The Numbers and Calculations content accounts for 69% of the entire elementary level mathematics curriculum. The Numbers and Calculations content provides students with essential basic knowledge and skills about natural numbers, fractions, decimals, and calculations.

The content of teaching natural numbers includes reading, writing, comparing, ordering, and rounding decimal numbers. The content of calculations with natural numbers includes addition, subtraction of multi-digit natural numbers; Multiplying multi-digit numbers by natural numbers with no more than two digits, dividing multi-digit natural numbers by natural numbers with no more than two digits.

Students apply knowledge of natural numbers and calculations with natural numbers to solve situations in real life. Therefore, it is important to design problems that incorporate real-life information and situations to help students expand their knowledge and apply mathematical knowledge to solve problems.

# **3. RESEARCH RESULTS**

# **3.1.** Principles for proposing a process and designing realistic mathematical problems in teaching Natural Numbers and Calculations with Natural Numbers for elementary school students in Vietnam.

Principle 1. The process of designing realistic mathematical problems in teaching must ensure feasibility, not only applying to designing realistic mathematical problem of Natural numbers and calculations with natural numbers but also can be applied to design other content in teaching Mathematics.



#### ISSN 2581-5148

Vol. 8, Issue.3, May-June 2025, p no. 95-106

Principle 2. The designed problems should be practical and allow students to apply mathematical knowledge to real-life situations, expanding their understanding of the country's economic, cultural, and social context.

Principle 3. The designed problems ensure that they are oriented towards the required standards specified in the elementary school Mathematics program in the content of Natural Numbers and Calculations with Natural Numbers.

Principle 4. The information in the designed problem must ensure mathematical accuracy and practicality. Avoid situations where the problem is correct in mathematics but incorrect in practice.

Principle 5. The designed problem must ensure feasibility and stimulate students' interest in learning Mathematics. Through this, students can see that mathematics originates from practice and returns to serve practice.

## **3.2. Process of designing and using realistic mathematical problems in teaching the content of Natural Numbers and Calculations with Natural Numbers in elementary schools in Vietnam.** Step 1. Search for realistic information.

When designing realistic mathematical problem, it is necessary to search for information about the economic, political, cultural, and social situation of the locality and the country. This information needs to be carefully selected to suit the age group but also help expand students' knowledge.

Step 2. Determine the required standards and content.

Each learning task that students perform is aimed at achieving the required standards of the program. Therefore, to design problems that help students consolidate knowledge and practice skills, it is necessary to determine the required standards and content.

Based on the content of natural numbers and calculations with natural numbers in the Mathematics program to select and determine the appropriate required standards and content, the information that has been searched can be used to design the problem.

Step 3. Design the mathematical problem.

Based on the program's required standards and the realistic information available to design the problem. The designed problem needs to use precise mathematics language, avoid using ambiguous and concise words so that students can read and understand the mathematical information and determine the task to be performed.

Step 4. Organize teaching activities for the designed mathematical problem.

When a mathematical problem has been designed for use in mathematics lessons, teachers need design learning activities that give students the opportunity to apply their mathematical knowledge to solve



ISSN 2581-5148

Vol. 8, Issue.3, May-June 2025, p no. 95-106

mathematical problems. Through these activities, students can develop their mathematical problemsolving skill, mathematical communication skill, and mathematical reasoning and thinking abilities.

### 3.3. Example

**Example 1**. Design mathematical problems about natural numbers and calculations with natural numbers in teaching 4th-grade mathematics.

### Step 1. Search for realistic information

Searching for population information of several districts in 2024 of Nam Dinh province on the Internet through reliable electronic information pages. The results obtained are as follows:

No.	City/District	Population (people)
1	Nam Dinh City	243 675
2	Giao Thuy District	172 992
3	Hai Hau District	271 113
4	Y Yen District	236 159
5	Nam Truc District	188 965
6	Nghia Hung District	181 277

Step 2. Determine the required standards and content. From the searched information, determine the design of exercises such as reading, writing multi-digit numbers, comparing and ordering, rounding numbers, and practicing calculations with natural numbers.

Requirements to be achieved: Compare and order multi-digit natural numbers; Round natural numbers to the nearest hundred thousand; Perform addition and subtraction operations with multi-digit natural numbers.

Step 3. Design the mathematical problem Exercise 1. Read the following information and answer the questions The following table provides information on the population of some districts in Nam Dinh province as follows:

No.	District	Population (people)
1	Nam Đinh city	243 675
2	Giao Thuy district	172 992
3	Hai Hau district	271 113
4	Nam Truc district	188 965

a) Which district has the largest population? Which district has the smallest population?b) Write the names of the districts in order from the largest to the smallest population.



ISSN 2581-5148

Vol. 8, Issue.3, May-June 2025, p no. 95-106

Exercise 2. Read the following information and answer the questions: According to the 2024 population statistics, the population of Nghia Hung district is 181 277 people, and the population of Y Yen district is 236 159 people. Ask:

a) Which district has a larger population and how many more people does it have?b) What is the average population of each district

Exercise 3. In 2024, the population of Nam Dinh city is 243,675 people.

Anh said: "In 2024, the population of Nam Dinh city is about 200,000 people."

Linh said: "In 2024, the population of Nam Dinh city is about 300,000 people."

Which friend is correct? Explain.

Exercise 4. In 2024, the population of Nam Truc district is 188 965 people. The population of Giao Thuy district is less than the population of Nam Truc district 15 973 people and 63 167 people less than the population of Y Yen district. What is the population of Y Yen district in 2024?

Step 4. Organize teaching and learning activities for the designed mathematical problem. Exercise 1. Organize students to work individually, read the problem information, and do the exercises on the worksheet.

Full name:; Class							
WORKSHEET							
Read the following information and answer the questions.							
The following table provides information on the population of some districts in Nam Đinh							
province:							
]	No	District	Population (people)				
	1	Norr Dish City					
a) Which has the	1	Nam Dinn City	243 675	district largest			
	2	Giao Thuy District	172 992				
	3	Hai Hau District	271 113				
	4	Nam Truc District	188 965	C			
population? Which district has the smallest population?							
b) Write the names of the districts in order from the largest population to the smallest.							

Students apply their knowledge of comparing and ordering multi-digit natural numbers to solve the problems on the worksheet. The teacher observes, supports students who have difficulties, and evaluates students who have completed the worksheet.

Organize whole-class activity: Student representatives present their solutions from the worksheet.



Vol. 8, Issue.3, May-June 2025, p no. 95-106

Other students comment and ask questions to their peers.

The teacher comments and confirms the correct results:

a) Hai Hau district has the largest population. Giao Thuy district has the smallest population.

b) The names of the districts in order from the largest to the smallest population are: Hai Hau, Nam Dinh city, Nam Truc, Giao Thuy.

Exercise 2. Organize students to work individually, read the problem, and answer the questions. Students apply their knowledge of comparing two multi-digit natural numbers, subtracting multi-digit natural numbers, and finding the average of two numbers to solve the problem.

Organize students to work in pairs: Students ask and answer questions about the results of the problem. a) Y Yen district has a larger population than Nghia Hung district.

The population of Y Yen district is greater than that of Nghia Hung district by:

236 159 – 181 277 = 54 882 (people)

Thus, Y Yen district has 54 882 more people than Nghia Hung district.

b) The average population of each district is:

(236 159 + 181 277) : 2 = 208 718 (people) Answer: 208

Answer: 208 718 people.

Organize students to work as a whole class: Representatives from pairs conduct question and answer sessions. Other students ask questions to the pairs. Students comment and supplement (if necessary). The teacher comments, evaluates, and confirms the correct results of the problem.

Exercise 3. Organize individual activity, students read the problem statement and answer the questions. The population of Nam Dinh province in 2024 is 243 675 people. When rounding to the nearest hundred thousand, we can say "The population of Nam Dinh province in 2024 is approximately 200 000 people." Both students rounded the population of Nam Dinh province to the nearest hundred thousand. Anh's result is correct, Linh's result is wrong.

Organize whole-class activity: Student representatives state the results of the problem and explain how to solve it. Students comment and supplement (if necessary).

The teacher comments on and evaluates the students' work and confirms the correct results of the exercise.

Exercise 4. Organize students to work individually, read the problem statement, and underline the keywords in the problem.





Vol. 8, Issue.3, May-June 2025, p no. 95-106

In 2024, the population of Nam Truc district is 188 965 people. The population of Giao Thuy district is 15 973 people less than the population of Nam Truc district and 63 167 people less than the population of Y Yen district. What is the population of Y Yen district in 2024?

Organize students to work in pairs, discuss, and answer the questions:

What does the problem state? (In 2024, the population of Nam Truc district is 188 965 people. The population of Giao Thuy district is 15 973 people less than the population of Nam Truc district and 63 167 people less than the population of Y Yen district.)

What does the problem ask? (What is the population of Y Yen district in 2024?)

Organize students to discuss in groups, analyze the problem, and find a solution:

- Find the population of Giao Thuy district by performing subtraction.

- Find the population of Y Yen district, perform the addition.

Organize students to present their solutions individually.

The population of Giao Thuy district is:

188 965 – 15 973 = 172 992 (people) The population of Y Yen district is: 172 992 + 63 167 = 236 159 (people) Answer: 236 159 people.

Organize a whole-class activity: Student representatives present their solutions, other students comment and ask questions, for example, "Explain why addition is performed when finding the population of Y Yen district?"

The teacher comments on, evaluates the work, and confirms the results of the exercise.

Example 2. Designing mathematical problems about natural numbers and calculations with natural numbers in teaching Mathematics in 3rd grade.

Step 1. Search for realistic information

According to the Statistical Yearbook, the number of buffaloes in some districts of Bac Giang province in the period 2019 - 2022 is as follows:

No.	District	2019	2020	2021	2022
1	Yen The District	6 131	6 004	5 016	5 197
2	Tan Yen District	3 595	3 467	2 956	2 865
3	Lang Giang District	4 773	4 285	3 581	3 423
4	Luc Nam District	6 834	6 549	5 856	4 826
6	Son Dong District	6 500	5 223	3 017	2 162



Vol. 8, Issue.3, May-June 2025, p no. 95-106

Step 2: Determine the required standards and content.

From the available information, provide the number of buffaloes in Bac Giang province in the period 2019 - 2022. The statistical table provides specific data, from which to design problems related to natural numbers.

Requirements to be achieved: Compare two natural numbers within the range of 10 000; Determine the largest and smallest numbers in a group of no more than four numbers within the range of 10 000; Round numbers to the tens, hundreds, and thousands place; Perform addition without carrying and with carrying within the range of 10 000.

Mathematical content: Comparing and ordering natural numbers within the range of 10 000; Roundingnatural numbers to the tens place; Adding natural numbers within the range of10 000.

Step 3. Design the mathematical problem

Exercise 1. Read the information and answer the questions

The number of buffaloes in some districts of Bac Giang province in 2022 in the districts of Yen The, Tan Yen, Lang Giang, Son Dong are as follows:

5,197 with, 2,865 with, 3,423 with, 2,162 with

a) Which district has the most buffaloes? Which district has the fewest buffaloes?

b) Which district has 2 865 buffaloes? Which district has more buffaloes than Tan Yen district but fewer than Yen The district?

c) Write the names of the districts in ascending order of the number of buffaloes in 2022.

Exercise 2. Read the information and round the numbers to the tens place, then continue writing in the blank spaces

The number of buffaloes in Luc Nam district in four years is as follows:

2019: 6,834 heads; 2020: 6,549 heads; 2021: 5,865 heads; 2022: 4,826 heads

The number of buffaloes raised in Luc Nam district in 2019 is approximately...... buffaloes.

In 2020, Luc Nam district raised approximately..... buffaloes.

The number of buffaloes raised in Luc Nam district in 2021 is approximately...... buffaloes.

In 2022, Luc Nam district raised approximately..... buffaloes.

Exercise 3. In 2022, Lang Giang district raised 3 423 buffaloes. Knowing that the number of buffaloes in 2022 of Luc Nam district is 1 961 more than Lang Giang district. How many buffaloes did both districts raise in 2022?

Step 4. Organize teaching activities for the designed mathematical problem.

Exercise 1. The exercise provides information on the number of buffaloes raised in four districts in 2022. The exercise requires students to read the information and answer the questions. The problem has a practical element because this is real information in practice.

The teacher organizes students to read the problem statement and individually complete the exercise. The problem is given in the form of a series of data. Students apply knowledge of series of data, about comparing and ordering natural numbers to answer the questions.

Then students will read the problem information and understand the content as follows:

Yen The district has 5 197 buffaloes; Tan Yen district has 2 865 buffaloes; Lang Giang district has 3 423 buffaloes; Son Dong district has 2 162 buffaloes.



Vol. 8, Issue.3, May-June 2025, p no. 95-106

To answer the questions, students compare and order the numbers 5 197, 2 865, 3 423, 2 162 in ascending order: 2 162; 2 865; 3 423; 5 197. From there, students get the answer to the problem:

a) Yen The district has the largest number of buffaloes. Son Dong district has the fewest number of buffaloes.

b) Tan Yen district has 2 865 buffaloes. Lang Giang district has more buffaloes than Tân Yên district but fewer than Yên Thế district.

c) Write the names of the districts in ascending order of the number of buffaloes in 2022.

Son Dong, Tan Yen, Lang Giang, Yen The.

The whole class participates in the activity, a student representative presents the work, and students below ask questions and answer about the work with friends. For example, students ask: How do you know that Yen The district has the largest number of buffaloes? When writing the names of the districts in ascending order of the number of buffaloes raised in 2022, how did you do it?

Students comment on their friends' work, supplement or correct it (if necessary). Students receive comments from the teacher and correct the results of the exercise.

Exercise 2. Students read the problem, identify the task to be solved, which is to round natural numbers to the tens place. Students apply the knowledge of rounding natural numbers to practical situations. In life, it is sometimes necessary to round numbers to estimate calculations or talk about approximate data. Students work individually on the exercises.

The number of buffaloes raised in Luc Nam district in 2019 is approximately 6 830.

In 2020, Luc Nam district raised approximately 6 550 buffaloes.

The number of buffaloes raised in Luc Nam district in 2021 is approximately 5 870.

In 2022, Luc Nam district raised approximately 4 830 buffaloes.

Organize pair activities, asking and answering about the results of the exercises and explaining how to do them.

Organize whole-class activities: Representatives of pairs ask and answer about the results of the exercises. Students comment and supplement (if necessary). The teacher comments, evaluates, and corrects the results of the exercise.

Exercise 3. Practice exercise to solve the problem in two calculation steps. Students apply knowledge of adding two natural numbers. The teacher organizes students to work individually, read the problem and answer the question:

- What does the problem tell us? (In 2022, Lang Giang district raised 3 423 buffaloes. It is known that the number of buffaloes in 2022 of Luc Nam district is 1 961 more than Lang Giang district).

- What does the problem ask? (How many buffaloes did both districts raise in 2022?)

Students underline the mathematical keywords in the problem:

In 2022, Lang Giang district raised 3 423 buffaloes. It is known that the number of buffaloes in 2022 of Luc Nam district is 1 961 more than Lang Giang district. How many buffaloes did both districts raise in 2022?

Students work in pairs asking and answering about the given information and the information to be found in the problem.

Students discuss how to solve the problem:



Vol. 8, Issue.3, May-June 2025, p no. 95-106

- Find the number of buffaloes raised in Luc Nam district, perform addition.

- Find the number of buffaloes raised in both districts, perform addition.

Organize students to work individually to complete the solution

The number of buffaloes raised in Luc Nam district is:

3423 + 1961 = 5384 (buffaloes)

The number of buffaloes raised in both districts is:

3 423 + 5 384 = 8 807 (buffaloes)

Answer: 8 807 buffaloes.

Organize whole-class activities, a student representative presents the solution. Students below ask questions, and the presenting student explains how to do it. Students comment and evaluate their friend's work. The teacher comments and corrects the student's work.

# 4. CONCLUSION

Applying the process of designing and using problems linked to practice in teaching natural numbers and calculations with natural numbers will contribute to helping students achieve the required outcomes of the mathematics program. By solving realistic mathematical problem, students consolidate their knowledge, practice skills, and have the opportunity to develop component competencies of mathematical competence. Teachers need to pay attention to the activity of designing and using problems linked to practice in teaching at the elementary level.

# REFERENCES

1. Ministry of Education and Training (2018). General Education Program for Mathematics (Promulgated together with Circular No. 32/2018/TT-BGDDT dated 2018-12-26 of the Minister of Education and Training). Hanoi.

2. Tran Cuong, Nguyen Thuy Duyen (2018). Understanding the theory of mathematics education associated with practice and applying it to construct practical exercises in teaching mathematics. Journal of Education, special issue No. 2, 2018-05, pp. 165-169.

3. Nguyen Danh Nam (2020). Some issues of mathematics education associated with practice. Journal of Education, No. 487 (Issue 1 - 10/2020), pp. 15-21.

4. Le Thuy Trang, Pham Anh Giang, Nguyen Tien Trung (2021). Applying Realistic Mathematics Education theory in teaching: some challenges, principles and recommendations. Journal of Education, No. 494 (Issue 2 - 1/2021), pp. 37-43.

5. Nguyen Tien Trung, Kim Anh Tuan, Nguyen Bao Duy (2019). Applying the theory of mathematics education associated with practice in teaching mathematics. Journal of Education, No. 458 (Issue 2 - 7/2019), pp. 37-44.

6. Freudenthal, H. (1968). Why to teach mathematics so as to be useful. Educational Studies in Mathematics, 1, 3-8.

7. Freudenthal, H. (1971). Geometry Between the Devil and the Deep Sea. In: Steiner, H.G. (eds) The Teaching of Geometry at the Pre-College Level. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-5896-3\_10



#### ISSN 2581-5148

Vol. 8, Issue.3, May-June 2025, p no. 95-106

8. Van den Heuvel-Panhuizen, M., & Drijvers, P. (2020). Realistic Mathematics Education. Encyclopedia of Mathematics Education, pp. 713-717. https://doi.org/10.1007/978-3-030-15789-0\_170