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Teaching Numbers and Calculations to Grade 5 Students in the Direction of Developing Mathematical Communication Skills

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ABSTRACT: Mathematical communication is carried out during mathematics lessons. Through communication, students discuss and argue mathematically in order to present their thoughts and perspectives on a mathematical problem. In teaching Numbers and Operations with the aim of developing mathematical communication competence for Grade 5 students, the focus is on concept formation, rule acquisition, and problem solving. Teachers design appropriate learning activities so that students have opportunities to develop mathematical communication competence.

KEYWORDS: primary education, competence, mathematical communication, numbers and operations.

1. INTRODUCTION

Numbers and Operations constitute a core content strand in the Mathematics Curriculum at the primary level in Vietnam. Competence-based teaching and learning is being implemented in general education schools. Mathematical communication competence is one of the five essential competencies that should be formed and developed in students during mathematics instruction. Therefore, teaching the Numbers and Operations strand to Grade 5 students with a focus on developing mathematical communication competence is necessary.

2. MATHEMATICAL COMMUNICATION COMPETENCE

"Competence is a personal attribute formed and developed through innate qualities and the process of learning and training, which enables individuals to mobilize and integrate knowledge, skills, and other personal attributes such as interests, beliefs, willpower, etc., in order to successfully perform a specific activity and achieve desired outcomes under given conditions" [1].

- Mathematical communication is understood as the process of exchanging information during mathematics lessons between teachers and individual students, among students themselves, between individual students and the class, and between teachers and the whole class, aiming at achieving the learning objectives of mathematics. The main tools used in mathematical communication are mathematical language and natural language.
- Mathematical communication competence can be defined as the ability to use mathematical language to read and write mathematical texts, and to exchange mathematical information during mathematics lessons.

The Mathematics Curriculum specifies the expected requirements for mathematical communication competence at the primary level as follows [1]:

- Listening, reading, and taking notes (summarizing) of the key mathematical information in texts or messages delivered by others (at a simple level), thereby identifying the problem to be solved.
- Presenting and expressing (orally or in writing) mathematical ideas and solutions in interaction with others (without the requirement of complete precision and thoroughness). Asking and answering questions when reasoning and solving problems.
- Using mathematical language in combination with natural language and gestures to express mathematical content in simple situations.
- Demonstrating confidence when answering questions, presenting, and discussing mathematical content in simple contexts.

3. TEACHING NUMBERS AND OPERATIONS WITH A FOCUS ON DEVELOPING MATHEMATICAL COMMUNICATION COMPETENCE

3.1. Teaching Concept Formation Oriented Toward Developing Mathematical Communication Competence

a) Objectives

To help students:

- Understand mathematical concepts and rules in a natural way through the process of experiencing and discovering from real-life situations.
- Develop mathematical communication competence in Grade 5 students through learning activities in mathematics.

b) Procedure

Step 1. Reading mathematical information and identifying the problem to be solved

The teacher designs a short story or a situation connected with real life. This story or situation contains a mathematical problem that needs to be solved. Students read the story or situation, analyze it to identify the mathematical problem, and share their findings with peers and the whole class.

Step 2. Exploring and forming new concepts

Students are organized to read mathematical information and share with their peers what they have read. A representative student presents the information to the class. The teacher raises questions related to that information. The teacher introduces the mathematical concept to be formed and asks students to repeat it. The teacher then provides several direct application situations so that students can initially understand the concept more deeply.

Step 3. Practicing and applying the concept in mathematical learning

Students practice and apply the concept individually, in pairs, in groups, and as a whole class. First, each student solves the problem individually by reading the mathematical content and determining a solution. Next, the teacher organizes pair or group activities so that students can tell their peers about their solutions or listen to others. Finally, class-wide activities are organized so that students have opportunities to present, explain, or answer questions about their work. Students may respond to peers by agreeing or disagreeing with the presented ideas.

c) Teaching considerations

– The designed situation should be connected to real life and contain a mathematical problem.
– The language used to describe the situation should be clear, concise, and appropriate to students' psychology and age level.
– Activities should be organized in various forms to create opportunities for students to communicate during mathematics learning.

d) Illustrative example

Step 1. Reading mathematical information and identifying the problem to be solved Students read the situation and role-play it.

Student 1: There is a rectangle divided into 10 equal parts. Three parts are shaded.

Student 2: Three tenths of the rectangle are shaded. How is "three tenths" written in linear form? What kind of number is it?

Through this situation, students identify the problem to be solved: *How is "three tenths" written in linear form? What is it called?* The teacher connects this to the lesson.

Step 2. Experiencing, exploring, and forming new concepts

Students manipulate a rectangular strip of paper divided into 10 equal parts. They shade 1 part and state: "One-tenth of the strip has been shaded." Students write $\frac{1}{10}$ and read "one tenth." The teacher introduces: $\frac{1}{10}$ is also written as 0.1 (that is, $\frac{1}{10} = 0.1$). Zero point one is the linear form of the decimal fraction $\frac{1}{10}$.

Thus: $\frac{1}{10}$ written as 0.1; "0.1" is read as *zero point one*

$0.1 = \frac{1}{10}$; 0.1 is a decimal number.

The teacher asks students to write $\frac{3}{10}$ as a decimal, then read and write the number.

$0.3 = \frac{3}{10}$; "0.3" is read as zero point three; 0.3 is a decimal number.

The teacher asks students to read the following information and share with a peer:

Table: Structure of Decimal Numbers

Decimal Number	Integer Part (Ones place)	, (Decimal point)	Decimal Part (Tenths place)
0.1	0	.	1
0.3	0	.	3

Students share with their peers about the content they have just read.

The teacher introduces:

- The decimal number **0.1** consists of the integer part **0** and the decimal part **1**.
- The decimal number **0.3** consists of the integer part **0** and the decimal part **3**.

The decimal point is written to separate the integer part from the decimal part. The first digit after the decimal point is the digit in the tenths place.

Step 3. Practice, application, and consolidation of the concept

Organize students to solve exercises on reading and writing decimal numbers. Students exchange, discuss, and debate mathematical ideas with peers to gain a deeper understanding of decimal numbers and how to read and write them. Students are also guided to recognize that in real-life situations, decimal numbers are used to represent quantities such as mass or volume on various products.

3.2. Teaching Rules and Algorithms Oriented Towards Developing Mathematical Communication Competence

a) Objectives

To help students:

- Understand the essence of the rules and algorithms being taught.
- Apply the rules and algorithms to solve mathematical problems in learning mathematics and in real-life situations.
- Explain how to apply the rules and algorithms when solving problems.

b) Teaching procedure

Students are guided to discover and formulate rules and algorithms through solving the given mathematical tasks. The teacher supports students in identifying the relevant prior knowledge that can be used in problem-solving. Students mobilize and connect this knowledge to propose possible solutions. Visual aids can also be employed by students in the process of recognizing rules and algorithms.

Students work in groups to initially predict the rules and algorithms. These predictions may be incomplete or inaccurate; therefore, the teacher plays the role of consolidating and standardizing the knowledge for students.

After students have acquired the accurate rules and algorithms, the teacher organizes activities where students apply them to solve simple problems that directly require the newly established rules or algorithms.

The teacher designs practice exercises that encourage students to solve problems collaboratively, allowing opportunities for discussion and debate. Students are encouraged to present their solutions and are guided to ask clarifying questions, such as requesting peers to explain their methods. This process fosters students' confidence in expressing mathematical ideas, while simultaneously developing their listening and critical thinking skills. The teacher acts as a facilitator, directing and guiding students to engage in effective debate.

The teacher may pose reflective questions such as: *"Is there another solution?"* or *"Why did you choose this method?"* — prompting students to rethink and articulate their reasoning more clearly using mathematical language.

Furthermore, teachers should integrate real-life mathematical problems and situations so that students recognize the significance of mathematics. In doing so, students can combine mathematical language with natural language when addressing problems.

c) Notes

- When students are exploring and attempting to formulate rules, teachers should not expect them to derive the standard rules immediately.
- The search for rules should begin with visual representations or build on existing knowledge.
- Assessment should be based on the effectiveness of discussion, presentation, and group collaboration.
- Group tasks must be clearly assigned to ensure all members understand and participate appropriately.

d) Illustrative example:

Teaching the rule of rounding decimal numbers to the nearest whole number. Students observe and read the situation presented in a picture.

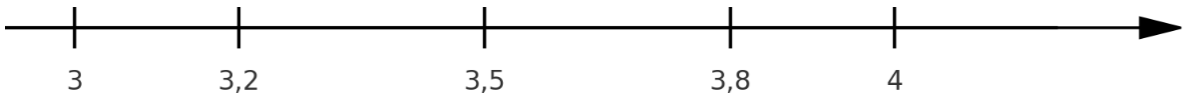
Classroom Activity Organization: Whole-class Role-play

Student A (Minh – the man student): My house is 3.8 km away from school.

Student B (Lan – the women student): Minh's house is about 4 km away from school.

Teacher raises the problem and connects to the lesson: Minh's house is 3.8 km from school, but Lan says it is about 4 km. Why can Lan say that?

Teacher asks students to observe the number line and read the numbers shown on it.



Group work: Students discuss and answer the following questions:

Which whole number is 3.2 closer to? What is the result of rounding 3.2 to the nearest whole number?

Which whole number is 3.8 closer to? What is the result of rounding 3.8 to the nearest whole number?

Whole-class activity: Representatives of student groups present their discussion results.

3.2 is closer to 3 than to 4. Rounding 3.2 to the nearest whole number gives 3.

3.8 is closer to 4 than to 3. Rounding 3.8 to the nearest whole number gives 4.

Teacher organizes further exploration: Students identify the tenths digit of 3.2 and 3.8, then compare it with 5.

Students respond: The tenths digit of 3.2 is 2. Since $2 < 5$, rounding down gives 3. The tenths digit of 3.8 is 8. Since $8 > 5$, rounding up gives 4.

Teacher explains:

Rounding 3.2 to the nearest whole number gives 3 because $2 < 5$.

Rounding 3.8 to the nearest whole number gives 4 because $8 > 5$.

Teacher organizes further prediction task: Students observe 3.5 on the number line and predict the result of rounding 3.5 to the nearest whole number?

Students notice that 3.5 is equidistant from 3 and 4. When rounding 3.5, the result is 4.

Students identify the tenths digit of 3.5 as 5. Since $5 = 5$, they round up.

Teacher explains: Rounding 3.5 to the nearest whole number gives 4 because $5 = 5$.

Students predict the rounding rule for decimals to the nearest whole number.

Teacher finalizes the rule: When rounding a decimal to the nearest whole number, compare the tenths digit with 5: If it is less than 5, round down. If it is 5 or greater, round up.

3.3. Teaching Problem-Solving in Numbers and Operations with a Focus on Developing Mathematical Communication Competence

a) Objectives

The aim is to help students:

– Understand and flexibly apply the fundamental steps to solve a mathematical problem.

– Practice the ability to analyze and synthesize information in order to identify appropriate problem-solving strategies.

- Create opportunities to develop mathematical communication competence through practicing mathematical communication skills.
- Develop skills in translating from natural language to mathematical language when presenting solutions using mathematical symbols.

b) Teaching Procedure

Step 1. Analyzing and identifying the given data in the problem

The teacher organizes for students to read the problem statement and answer guiding questions to analyze it. Typical questions may include: *"What information does the problem provide?", "What does the problem ask?", "What type of problem is this?"* Students are asked to underline key information and may summarize the problem. From the summary, students can restate the problem in their own words. Group activities can be organized for students to discuss the given information, the unknowns, and the type of the problem.

Step 2. Planning the problem-solving strategy

The teacher organizes activities for students to think about possible solution strategies. Students may work in pairs or groups to explore different solutions. Through discussion and debate, students identify the most effective strategy for solving the problem. Students present their own ideas, give feedback, and evaluate each other's solutions. They learn to agree with or challenge different approaches. After discussion, students outline the specific steps for solving the problem.

Step 3. Presenting the solution

Students use a combination of mathematical language and natural language to present their solutions. They are required to write their answers clearly and coherently, making correct use of mathematical symbols. The teacher also organizes oral presentations of the solutions. Students are encouraged to ask questions and request explanations about their peers' solutions.

Step 4. Reviewing and evaluating the solution

Students re-read the problem statement and compare it with their solution, checking both the written explanation and the calculations. When reviewing, they focus on whether the explanation matches the computation, and whether there are any errors in calculation. The teacher may pose extension questions or ask students to find alternative solutions to the problem.

c) Notes for Teaching

- Activities should be designed to create opportunities for students to develop mathematical communication competence.
- Activities must highlight the active role of students, placing them at the center of the learning process. Encourage exploration, discussion, and debate to find appropriate solutions.
- Build a friendly and open learning environment where students feel confident to present their ideas, express agreement or disagreement with peers' solutions in groups or as a class.
- Evaluation should not only be based on the final answer but also on students' active participation in activities, their ability to present, listen, and engage in constructive argumentation.

d) Illustrative Example. Teaching problem-solving with the task of finding the percentage value of a given number

Problem: Mr. Nam deposits 200,000,000 VND in a one-year savings account with an annual interest rate of 6%. It is known that the deposit type is "interest paid at maturity." How much money, including both principal and interest, will Mr. Nam receive after one year?

Step 1. Analyzing and identifying the given data in the problem

Students read the problem statement and answer the questions: *What information is given in the problem? What is the problem asking?* Students work in pairs, asking and answering with their partners.

- What information is given? (Mr. Nam deposits 200,000,000 VND in a one-year savings account with an annual interest rate of 6%. It is known that the deposit type is "interest paid at maturity.")
- What is the problem asking? (How much money, including both principal and interest, will Mr. Nam receive after one year?)

Students underline the mathematical keywords in the problem: "Mr. Nam deposits 200,000,000 VND in a one-year savings account with an annual interest rate of 6%. It is known that the deposit type is 'interest paid at maturity.' How much money, including both principal and interest, will Mr. Nam receive after one year?"

Step 2. Planning the problem-solving strategy

Students work in groups to discuss and find a solution. They identify the mathematical knowledge needed: *Finding the percentage value of a given number; Addition of multi-digit whole numbers.*

Students may decompose the original problem into two simpler problems as follows:

- *Problem 1:* Mr. Nam deposits 200,000,000 VND in a one-year savings account with an annual interest rate of 6%. It is known that the deposit type is "interest paid at maturity." How much interest will Mr. Nam receive after one year?
- *Problem 2:* Mr. Nam deposits 200,000,000 VND. The interest received after one year is 12,000,000 VND. How much money, including both principal and interest, will Mr. Nam receive after one year?

Through this decomposition, students determine the solution method:

– Calculate the interest received after one year (by applying the method of finding the percentage value of a given number).
– Calculate the total amount received (principal + interest) after one year (by performing addition).

Step 3. Presenting the solution

Students work individually and write their solutions in their notebooks.

Solution: The amount of interest Mr. Nam will receive after one year is:

$$200\,000\,000 \times 6\% = 12\,000\,000\,(\text{VND})$$

The total amount (principal + interest) Mr. Nam will receive after one year is:

$$200\,000\,000 + 12{,}000{,}000 = 212{,}000{,}000\,(\text{VND})$$

Answer: 212 000 000 VND.

Step 4. Reviewing and evaluating the solution

Students read the problem statement again and check each step of the solution. They review the explanation and the calculations. Students discuss, exchange ideas, and explain their solutions to peers. They receive peer feedback. The teacher comments and confirms the correctness of the solution.

4. CONCLUSION

Teaching *Numbers and Operations* with an orientation toward developing mathematical communication competence for Grade 5 students is implemented through teaching concepts, rules, and problem solving. Teachers organize learning activities that create opportunities for students to enhance their ability to communicate mathematically. Students are engaged in reading and writing mathematics by performing tasks in Mathematics lessons. They are encouraged to speak to their peers, listen to others, and express their own ideas during discussions in order to construct mathematical knowledge in *Numbers and Operations*. Through mathematical discussions and debates, students' mathematical communication competence is fostered.

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