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TEACHING MATHEMATICS IN GRADE 5 THROUGH REAL-WORLD CONTEXTS

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ABSTRACT

Teaching mathematics through real-world contexts helps students recognize that mathematics originates from real life and, in turn, serves real-life needs. When learning mathematics in connection with practical situations, students are able to apply mathematical knowledge to solve real-life problems. This paper proposes a process for teaching Grade 5 Mathematics through real-world contexts and presents illustrative examples following the proposed process.

KEYWORDS: Mathematics, primary school, real-world context, practical application, problem-solving.

1. INTRODUCTION

Teaching Mathematics through real-world contexts is becoming a prominent trend in mathematics instruction in Vietnamese general education. In the teaching process, teachers design introductory situations related to real-life contexts that align with the lesson content. Students then apply mathematical knowledge to solve these real-life situations. Teaching through real-world contexts contributes to developing students' application competence and mathematical problem-solving competence. Therefore, proposing a process for teaching Grade 5 Mathematics through real-world contexts is essential.

2. The Trend of Teaching Mathematics through Real-World Contexts in Vietnam

Mathematics and real life have always maintained a reciprocal relationship, influencing and supporting each other in their development. Real-world practice is the origin of mathematical knowledge; in other words, mathematics emerges from practical needs. At the same time, real life provides the foundation for the development of mathematics, and mathematics, in turn, serves students' everyday experiences. Furthermore, mathematics is applied extensively in science, technology, and production. Commenting on the relationship between mathematics and real life, researcher Edward stated: "*The powerful development of mathematics over thousands of years originates from life and ultimately serves the rich and diverse life of humankind*" [2]. Thus, real life is both the source and the destination of mathematics.

The dialectical relationship between mathematics and real life aligns with the epistemological

principle: *“From vivid perception to abstract thinking, and from abstract thinking back to practice—this is the dialectical path to the truth”* [4].

- Mathematics originates from real life: Arithmetic emerged from the need to count and calculate; geometry appeared in Ancient Egypt due to the need to measure land along the Nile River after seasonal flooding. In recent decades, with advances in science and technology, the applications of mathematics in daily life have become even more apparent. During instruction, teachers should integrate content that introduces the origins of mathematics so that students can recognize that mathematics is rooted in real-world contexts and exists all around them.

- Mathematics reflects real life: Every mathematical model reflects one or more real-life situations. In teaching, to help students recognize how mathematics reflects reality, teachers should guide them to explore mathematical concepts and identify practical images or situations related to those concepts. Students should also be encouraged to discover how these mathematical models appear in real life.

- Mathematics as a tool for solving real-world problems: In the teaching process, teachers should emphasize the connection between mathematics and real-life applications, helping students use mathematics to solve practical problems. Through this, students consolidate and deepen their understanding of mathematical knowledge.

3. Requirements for Teaching Mathematics in Connection with Real Life in Vietnam

Researchers in mathematics education in Vietnam have increasingly emphasized the trend of teaching mathematics through real-world contexts. Instruction aims not only to help students construct mathematical knowledge but also to apply mathematics to real-life situations.

- Connecting mathematical knowledge to real-world applications is always emphasized in the teaching of mathematics. Teaching should consistently reflect the principle: *“Learning must go hand in hand with practice; education must be combined with productive labor; theory must be linked with practice; school education must be connected with family and social education”* [4]. Nguyễn Bá Kim affirms the importance of *“strengthening the relationship between mathematics and real life; helping students construct knowledge and skills with a readiness for application; and enhancing mathematical practice and application”* [4].

- Applying mathematics to solve real-world problems. Mathematics originates from real life and eventually returns to serve real life. Trần Kiều stresses that *“the first and the final outcome of learning mathematics must be understanding the real-life origin of mathematics and improving the ability to apply it, forming the habit of using mathematics in practice”* [3]. Nguyễn Bá Kim also identifies the goals of mathematics instruction as equipping students with mathematical knowledge, skills, and the ability to apply mathematics in real situations. His proposed instructional principles emphasize: *“Clarifying the relationship between mathematics and real life; supporting students in constructing*

knowledge and developing application-oriented skills; and reinforcing mathematical application and practice” [4].

4. Teaching Mathematics in Grade 5 through Real-Life Contexts

4.1. Principles of Grade 5 Mathematics Instruction Oriented Toward Real-Life Application

a) Ensuring coherence between the concrete and the abstract, and between theory and practice

In teaching mathematics in general, and percentages in grade 5 in particular, it is necessary to ensure consistency between the concrete and the abstract. The abstract thinking of grade 5 students has begun to develop; therefore, teaching must ensure consistency between the concrete and the abstract.

Furthermore, teaching should emphasize the consistency between theory and practice. When forming knowledge for grade 5 students, it is necessary to connect it with reality, with what happens around them in their learning, play, and daily activities.

b) Ensuring appropriateness and suitability for Grade 5 learners

Instruction must match students’ psychological characteristics and cognitive levels. Teachers should provide real-life economic, cultural, and social information through contextualized problems to enrich students’ life experiences. Learning activities should be designed to stimulate interest, helping students participate enthusiastically and acquire mathematical knowledge naturally without boredom or fatigue.

c) Ensuring alignment between teacher activities and student activities

In competency-based instruction, students are active agents and play the central role in constructing knowledge. They participate actively in learning tasks and explore mathematical ideas independently. Teachers facilitate, guide, and support learners so that learning activities are meaningful and effective. Therefore, designed activities must ensure coherence between the teacher’s instructional role and students’ learning actions.

d) Ensuring scientific accuracy and real-life relevance

Instruction must be mathematically precise while remaining grounded in real-life contexts. Since mathematics originates from practice and returns to serve practice, teachers must skillfully integrate practical sources of mathematical knowledge. Students should be guided to apply mathematics to real-world problems and solve practical situations. Any mathematical task or problem must be evaluated both for its mathematical correctness and its practical relevance.

4.2. The Teaching Process for Grade 5 Mathematics Oriented Toward Real-World Application

Step 1. Identifying the Learning Objectives and Content of the Lesson or Topic

Before designing instructional activities, teachers examine the intended learning outcomes specified in the curriculum and determine the detailed content. At the same time, teachers need to review mathematical concepts related to the knowledge that students are expected to acquire.

Step 2. Designing an Introductory Activity Connected to Real-Life Contexts

The introductory activity is designed with the aim of motivating students, creating readiness for learning, and encouraging the exploration of new knowledge. Such activities stimulate students' active and creative engagement throughout the learning process. An effective introduction helps to arouse students' interest in learning. In teaching primary mathematics with a real-world orientation, learning situations should meet the criterion that mathematics originates from, and is rooted in, real-life contexts.

During instruction, teachers explore pictures, drawings, or familiar real-life situations to design the introductory activity. They make use of the practical origins of mathematics to spark students' learning motivation. Furthermore, the introductory activities should draw on students' prior experiences and real-world knowledge before they encounter new mathematical content.

Step 3. Inquiry and Knowledge Exploration

Students are guided to observe and manipulate concrete models or visual teaching aids so that they can partially discover mathematical ideas on their own. Therefore, when constructing new knowledge, teachers should facilitate opportunities for students to count objects or use manipulatives to identify quantities in different groups. These activities help develop students' learning behaviours and inquiry skills.

Step 4. Applying Knowledge to Solve Real-World Situations

Practice and reinforcement activities are designed to allow students to directly apply newly learned mathematical knowledge to problem-solving. This creates opportunities for students to strengthen skills and consolidate understanding. Students are encouraged to independently find solutions to problems and explain their reasoning to classmates. In this process, teachers emphasize individual engagement to ensure that every student has the opportunity to practise.

The Mathematics Curriculum of the General Education Program places strong emphasis on the application of mathematical knowledge to real-life situations. After learning each mathematical concept, students are expected to apply it to solve problems arising from practical contexts.

4.3. Illustrative Example**Example 1. Teaching the Concept of Multiplying Decimal Numbers through Real-World Contexts****Step 1. Identifying the Learning Objectives and Content of the Lesson or Topic**

Learning Objective: "Perform multiplication of a number by a decimal with no more than two decimal digits in the form $a.b$ or $0.ab$ " [1].

Content: Multiplication involving a decimal number with no more than two decimal digits in the form $a.b$ or $0.ab$.

Step 2. Designing an Introductory Activity Connected to Real-Life Contexts



Learners are assigned roles to read the scenario and think about the problem presented in that scenario.

Student 1: A decorative carpet has a length of 1.5 meters and a width of 0.8 meters.

Student 2: How many square meters is the area of the carpet?

Students identify the problem to be solved: calculating the area of the carpet, which is in the shape of a rectangle.

Students recognize that to find the area of a rectangle, they multiply its length by its width (using the same unit of measurement). Therefore, to find the area of the carpet, they multiply the length of the carpet by its width (in the same unit).

The length of the carpet is 1.5 m and the width is 0.8 m. To calculate the carpet's area, they compute $1.5 \text{ m} \times 0.8 \text{ m}$. Essentially, this requires finding the result of the multiplication 1.5×0.8 . Students state the multiplication 1.5×0.8 , and from here, the teacher transitions into the lesson.

Step 3. Inquiry and Knowledge Exploration

Students are organized into groups to discuss, set up the calculation, and perform the multiplication as they would with whole numbers.

Setting up the	Computing the product:	Placing the decimal point:
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operation: $\begin{array}{r} 1.5 \\ \times 0.8 \\ \hline \end{array}$ The setup is the same as multiplying two whole numbers	$\begin{array}{r} 1.5 \\ \times 0.8 \\ \hline 1.20 \end{array}$ Students perform the multiplication as if multiplying whole numbers.	$\begin{array}{r} 1.5 \\ \times 0.8 \\ \hline 1.20 \end{array}$ Since the factors 1.5 and 0.8 have a total of two digits after the decimal point, the product must also contain two digits in the decimal part.
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Thus, $1.5 \times 0.8 = 1.20$

Students are guided to discover the general rule for multiplying decimal numbers.

Step 4. Applying Knowledge to Solve Real-Life Situations

Problem 1.

According to the National Sleep Foundation of the United States, children aged 5 to 12 need 9 to 11 hours of sleep per day [6]. Hoa sleeps an average of 9.8 hours per day. How many hours does Hoa sleep in one week?

Students read the problem statement and underline the keywords.

According to the National Sleep Foundation of the United States, children aged 5 to 12 need 9 to 11 hours of sleep per day. Hoa sleeps an average of 9.8 hours per day. How many hours does Hoa sleep in one week?

Students work individually to complete the solution.

Solution

1 week = 7 days

The amount of time Hoa sleeps in one week is:

$$9.8 \times 7 = 68.6 \text{ (hours)}$$

Answer: 68.6 hours.

Students work in pairs to share their answers and explain their reasoning.

Whole-class activity: A representative presents the solution. Students give comments. The teacher reviews and confirms the correctness of the solution.

Problem 2.

The price of RON 95-III gasoline is 20,360 VND per liter [7]. Ms. Thuy fills a fuel tank with a capacity of 5.2 liters. How much money does she have to pay for that amount of gasoline?

Students read the problem and discuss with a partner the given information and what needs to be found.

Given information: – The price of RON 95-III gasoline is 20,360 VND per liter.

– Ms. Thuy buys 5.2 liters of gasoline.

Required information: – How much money does she have to pay for 5.2 liters of gasoline?

Mathematical problem to be solved: Find the total cost of buying 5.2 liters of RON 95 gasoline. Students work in groups (using the *Placemat Technique*) to solve the problem.

Solution

The amount of money needed to buy 5.2 liters of RON 95 gasoline is:

$$20,360 \times 5.2 = 105,872 \text{ (VND)}$$

Answer: 105,872 VND.

A representative from each group presents their group's result. Students comment and ask questions. The teacher evaluates the students' work.

Example 2. Teaching the Concept of Percentage through Real-Life Contexts

Step 1. Identifying the Learning Objectives and Content

Learning objective: "Recognize the percentage of two quantities of the same kind" [1]. Therefore, the lesson must enable students to understand the concept of percentage, how to read and write percentages, and the meaning of a percentage.

Step 2. Designing a Real-Life Introduction Activity

Based on the learning objective, the introductory activity should elicit students' prior knowledge and real-life experience related to percentages. In reality, although students have not formally learned about percentages, they may have encountered them in stores, supermarkets, or on mass media, and may know how to read them but not understand their meaning.

When learning about percentages, students observe the following images:



These images are commonly encountered by students in everyday life when going to supermarkets, traditional markets, or when seeing advertisements in shops and on mass media. Although students may not understand the meaning of these numbers, they are often able to read them. Therefore, when designing the introductory activity for teaching percentages, the teacher may ask students to read aloud the numbers shown in these images. If a student reads correctly, it demonstrates relevant life experience; if not, it is not problematic. Through this activity, students recognize that mathematics appears naturally in their daily lives, thereby fostering interest in exploring the numbers shown in the images.

Step 3. Exploration and Discovery of Knowledge

Activity 1. Forming the Concept of Percentage

The teacher prepares for each group a square divided into 100 equal small squares.

Students work in groups to carry out the following tasks:

- Take the given square divided into 100 equal small squares and shade 35 of those squares.
- Write the ratio of the number of shaded squares to the total number of squares in the figure.

During whole-class sharing, each group presents its result and other students give comments.

The teacher evaluates and confirms:

- The square is divided into 100 equal squares. There are 35 shaded squares. The ratio of the shaded squares to the total number of squares is (35 : 100) or $\frac{35}{100}$.

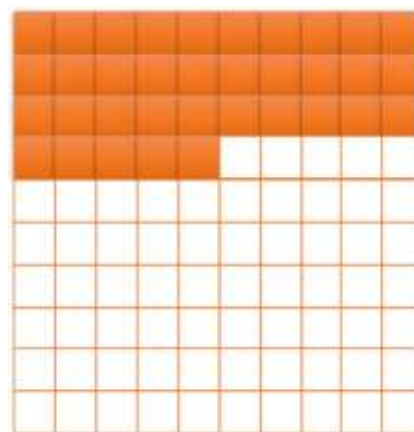
The teacher then introduces: The ratio of the number of shaded squares to the total number of squares is $\frac{35}{100}$.

We say, “Thirty-five percent of the square is shaded.”

We write $\frac{35}{100}$ or 35%. Therefore, $\frac{35}{100} = 35\%$.

$\frac{35}{100}$ or 35% is called the percentage of the shaded part compared with the entire square.

Students understand that 35% means: out of every 100 squares, 35 are shaded.



Activity 2. Determining Percentages

The teacher presents the following task: Determine the percentage in the following situation:

A store imports a total of 100 kilograms of sticky rice and ordinary rice, of which 45 kilograms are sticky rice. The percentage of sticky rice relative to the total amount of rice is

Students work individually to read the situation and determine the percentage to fill in the blank.

Students then discuss their answers with a partner and explain their reasoning.

Expected result: *A store imports a total of 100 kg of rice, including 45 kg of sticky rice. The percentage of sticky rice relative to the total amount of rice is 45%.*

Step 4. Applying Knowledge to Real-Life Situations

The teacher organizes practice activities to enable students to apply their understanding of percentages to solve mathematical problems and address real-life contexts.

Exercise. Did You Know?

At the beginning of 2023, social media users in Vietnam accounted for 71% of the total population. Among social media users in Vietnam, approximately 51% are female and 49% are male. The number

of Facebook users in Vietnam makes up about 67% of all social media users. The number of YouTube users in Vietnam accounts for about 64% of the total population [8].

a) Read the information above and share with your partner what you have understood. **b)** Complete the following table:

Writing the Percentage	Reading the Percentage

Students read the passage and tell their partner about the information they have understood. They are encouraged to ask their partners about how to read the percentages and about the meaning of the percentages mentioned in the passage.

Students work individually to complete the table.

Writing the Percentage	Reading the Percentage
71%	Seventy-one percent
51%	Fifty-one percent
49%	Forty-nine percent
67%	Sixty-seven percent
64%	Sixty-four percent

During whole-class sharing, several students present their results and others provide comments.

The teacher evaluates and asks students to explain the meaning of the percentages appearing in the passage. For example, the teacher may ask: *What does 71% mean in the passage?* A student may answer: *The percentage of social media users in Vietnam accounts for 71% of the total population, which means that for every 100 people, 71 use social media.*

5. CONCLUSION

Applying the instructional process for Grade 5 Mathematics in a real-world-oriented direction creates opportunities to develop students' competencies. When teaching Mathematics in Grade 5 with a real-life approach, teachers need to design introductory activities that present problem situations embedded in authentic contexts. Students apply mathematical knowledge to solve situations arising in their

everyday environment. This helps them recognize that mathematics originates from real life and, in turn, serves real-life needs.

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