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# FORMATION AND DEVELOPMENT OF MATHEMATICAL LANGUAGE FOR ETHNIC MINORITY STUDENTS IN TEACHING NUMBERS AND OPERATIONS IN GRADE 1

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## ABSTRACT

Numbers and operations are one of the three key content domains in the Mathematics Curriculum under Vietnam's General Education Program. Ethnic minority students mostly live in remote mountainous areas, where both geographical and economic conditions are challenging. Their primary language of daily communication is typically their mother tongue (not the common language). As a result, when entering school, these students face learning difficulties due to language barriers, with Vietnamese serving as their second language. In this study, we explore and propose strategies to develop mathematical language for ethnic minority students in teaching numbers and operations in Grade 1.

**KEYWORDS**: Students, ethnic minorities, language, mathematical language, Grade 1 mathematics

## I. INTRODUCTION

Mathematical language serves as a means of mathematical communication and a tool for mathematical thinking. It is used in math lessons and in all activities that involve mathematical content. Mathematical language plays a significant role in students' learning outcomes in mathematics. For first-grade ethnic minority students, learning mathematics—particularly the domain of Numbers and Operations—presents even greater challenges due to language barriers. Therefore, in teaching Numbers and Operations, it is essential to prioritize the development of students' mathematical language, especially for ethnic minority learners. In this context, our study aims to propose several strategies for developing mathematical language among first-grade ethnic minority students in the teaching of Numbers and Operations.

## II. Content

### 1. Mathematical Language

### 1.1. Definition

Various mathematics education researchers have offered different perspectives on the concept of mathematical language. In this paper, we adopt the following definition: Mathematical language is "a

system of symbols, signs, words, phrases, and rules for their combination used to express mathematical content in a logical, precise, and clear manner. Symbols include visual representations, diagrams, and models of concrete objects. Signs consist of numbers, letters, alphabetic characters, arithmetic operators, and relational symbols used in mathematics" [1].

### 1.2. Characteristics of Mathematical Language

Mathematical language, being primarily composed of symbols and mathematical terminology, possesses the full features of a scientific language: Monolithic, systematicity, and abstraction [2].

*1.2.1. The language of mathematics is monolithic.*

Monolithic refers to the property that each word, phrase, or symbol in mathematical language has one and only one meaning. Its interpretation does not change regardless of context. Example: The word "add" is represented by the symbol "+", denoting one of the four fundamental arithmetic operations, with the meaning "to combine quantities to find the total." In the expression 5 + 2, the symbol "+" consistently means "combine to find the sum." Monolithic in mathematical language is evident not only in meaning but also in form. Most mathematical terms are expressed through symbols. For instance, "divides evenly" is denoted by "⋮", and "area" is represented by the letter "S".

*1.2.2. The language of mathematics is systematic*

Every word or phrase in mathematical language has a defined position within the system of mathematical concepts. When removed from this system, its meaning may be lost or altered. Example: The word "product" in mathematics refers to "the result of a multiplication operation." However, in everyday Vietnamese, outside the mathematical context, it can mean "accumulated result from continual effort or savings" [2]. Formally, systematicity is reflected in the interdependence of mathematical signs. For instance, the digit "6" is understood as the natural number that comes after "5" and before "7." The set of natural numbers is denoted by $\mathbb{N}$, and the set of non-zero natural numbers is denoted by $\mathbb{N}^*$. Thus, systematicity in mathematical language is evident both in content and in form. When mathematical terms are removed from their system, their meaning may be lost. This systematic nature contributes to the precision and conciseness of mathematics.

*1.2.3. Mathematical language is abstract*

Mathematics deals with numbers and spatial relationships derived from the objective world. As such, mathematics itself is abstract, and so is the language used to express its content. The abstract nature of mathematical language is reflected in the semantics of its symbols and terms. Certain words in mathematical language carry meanings that differ from their use in everyday language. This discrepancy can cause confusion, especially for young learners.

## 2. An Overview of the Communication Characteristics of First-Grade Ethnic Minority Students

First-grade ethnic minority students are typically 6 to 7 years old. Most of these children grow up in remote, mountainous areas, with socio-economic and natural conditions that differ from those of urban or lowland areas. These circumstances contribute to specific developmental characteristics.

Before entering first grade, these children mainly communicate within their ethnic communities, shaped by the traditions and customs of their respective cultures. Their communication environment is limited, primarily involving family and local village members, but remains highly influential. In this context, students exchange information and express emotions using their mother tongue as the primary means of communication. Other communication tools are limited, resulting in distinct speech patterns, thought processes, and behaviors.

Ethnic minority students often appear reserved, reluctant to engage in learning activities, and passive in acquiring new knowledge. These traits pose challenges for organizing learner-centered instructional activities, especially under pedagogical reforms that emphasize active student engagement. Students may be hesitant to interact with unfamiliar individuals, speak infrequently, and rarely express their own opinions.

In school, Vietnamese is the primary language of communication and instruction. For ethnic minority students, Vietnamese functions as a second language, creating significant obstacles in both communication and the acquisition of academic knowledge.

Among peers, these students tend to communicate in their mother tongue. The transition from using their native language to using Vietnamese in academic settings represents a fundamental shift. Consequently, it can be concluded that ethnic minority students face considerable challenges in using Vietnamese for communication, and their established habits of relying on their mother tongue can negatively impact their learning process.

## 3. Strategies for Developing Mathematical Language for First-Grade Ethnic Minority Students in Teaching Numbers and Operations

### 3.1. Organizing Activities for Acquiring Mathematical Language among First-Grade Ethnic Minority Students in Teaching Numbers and Operations

*a) Objectives of the Strategy*

This strategy aims to help students:

- Acquire the vocabulary of mathematical language, including terminology, symbols, representations, etc., used in mathematics.
- Understand the semantics of mathematical terms and symbols.
- Accurately use mathematical language in various mathematics learning situations, particularly in the domain of Numbers and Operations.
- Apply mathematical language in both mathematics learning and real-life contexts.

International Journal of Education and Social Science Research

ISSN 2581-5148

Vol. 8, Issue.4, July-Aug 2025, p no. 292-301

*b) Implementation Procedures*

Step 1. Introduce the vocabulary of mathematical language

Step 2. Design learning activities to help students become familiar with and receive the semantics and syntax of mathematical language

Step 3. Organize students to use mathematical language in different situations when learning mathematics

*c) Implementation Notes*

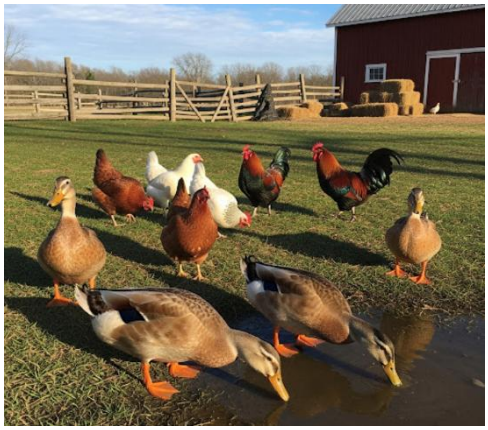
- When using visual aids to introduce mathematical vocabulary to first-grade ethnic minority students, ensure that the images are familiar, culturally relevant, and closely related to their daily lives.
- Avoid introducing too many terms and symbols at once. Instead, gradually present new vocabulary, allowing students to fully comprehend both the meaning and structure of mathematical language.
- Guide students in memorizing mathematical terms and symbols by phoneticizing them into their native language or associating them with concrete and visual imagery.

*d) Illustrative Example*

**Example:** Organizing activities for acquiring the terms and symbols "greater than, symbol >," "less than, symbol <," and "equal to, symbol =" when teaching first-grade ethnic minority students.

*Step 1*. Introducing the vocabulary of mathematical language

The teacher organizes for students to observe a picture and describe what they see. Students observe that the picture depicts chickens and ducks. They can state that the number of chickens is greater than the number of ducks, or that the number of ducks is less than the number of chickens.



The teacher asks questions to help students determine the quantities of chickens and ducks.

Students count and find there are 6 chickens and 4 ducks. The teacher introduces: "The number of chickens is greater than the number of ducks. The number of chickens is 6, and the number of ducks is 4. We say: six is greater than four." The teacher then introduces the symbol ">" and how to write it.

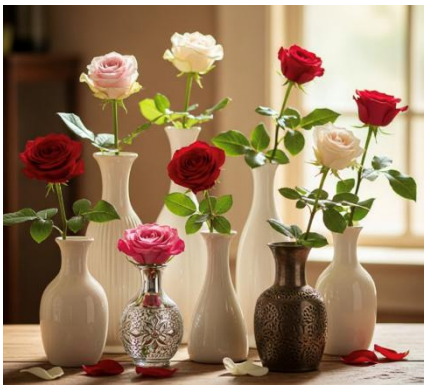
Students then observe another picture and describe it: "The picture shows pears and apples." They also describe: "The number of apples is greater than the number of pears" or

International Journal of Education and Social Science Research

ISSN 2581-5148

Vol. 8, Issue.4, July-Aug 2025, p no. 292-301

"The number of pears is less than the number of apples." The teacher asks students to count the number of pears and apples. Students find there are 4 pears and 7 apples. The teacher introduces: "The number of pears is less than the number of apples. The number of pears is 4, and the number of apples is 7. We say: four is less than seven." The teacher introduces the term "less than" and the symbol "<."



Students then observe another picture and describe it. For example: "The picture shows vases, each with one flower," "The number of flowers exactly matches the number of vases — no extras," "The number of flowers is equal to the number of vases." The teacher prompts students to count the flowers and vases. Students find there are 8 flowers and 8 vases. The teacher introduces: "The number of flowers is equal to the number of vases, and both are 8. We say: eight equals eight." The teacher then introduces the term "equal to" and the symbol "=."

**Step 2.** Designing learning activities to familiarize students with the semantics and syntax of mathematical language

The teacher explains: "When we say six is greater than four, we write the number 6, then the symbol >, then the number 4, with no commas, periods, or other marks in between: 6 > 4."

Similarly: "Four is less than seven" is written as 4 < 7; "Eight equals eight" is written as 8 = 8. The teacher organizes for students to practice writing the symbols >, <, and =.

**Step 3.** Organizing for students to use mathematical language in different contexts when learning mathematics

***Exercise 1*. Observe the pictures and write >, <, or = in the blank spaces:**

2 .... 3

5 ... 4

3 ... 3

The teacher organizes for students to observe each picture, describe the objects in it, count them, then state and write the appropriate symbol.

- In the first picture, students state: "There are 2 cups and 3 plates. Two is less than three." They write "<" in the blank.
- In the second picture: "There are 5 pencils and 4 pens. Five is greater than four." They write ">" in the blank.
- In the third picture: "There are 3 erasers and 3 pencils. Three equals three." They write "=" in the blank.

International Journal of Education and Social Science Research

ISSN 2581-5148

Vol. 8, Issue.4, July-Aug 2025, p no. 292-301

The teacher organizes for students to point to each result and read it aloud using mathematical language.

*Exercise 2.* >, <, = ?

| | | |
|---|---|---|
| 8 ..... 10 | 2 ..... 2 | 7 ..... 0 |
| 9 ..... 5 | 6 ..... 8 | 6 ..... 6 |

Students work individually to complete the task. The teacher provides assistance if any student experiences difficulty.

Class activity: Selected students present their answers. Other students give feedback. The teacher confirms the correct answers.

| | | |
|---|---|---|
| 8 ...<... 10 | 2 ...=... 2 | 7 ...>... 0 |
| 9 ...>... 5 | 6 ...<... 8 | 6 ...=... 6 |

Finally, the teacher organizes for students to read the completed results aloud.

### 3.2. Developing Communication Skills in Mathematical Language for Ethnic Minority Grade 1 Students in Teaching "Numbers and Operations"

*a) Objective of the measure*

To help students:

- Develop listening and speaking skills in mathematical language through cooperative group activities.
- Develop reading and writing skills in mathematical language through problem-solving activities and the application of mathematics to real-life situations.
- Gain opportunities to practice and expand their mathematical language in the context of learning mathematics.

*b) Procedure for implementing the measure*

**Step 1.** Organize for students to read mathematical content and identify the vocabulary of mathematical language present in the given information.

**Step 2.** Use mathematical language in the process of finding solutions to problems.

**Step 3.** Present problem-solving methods using mathematical language.

*c) Implementation notes*

- Provide ample opportunities for students to use mathematical language in mathematics lessons by practicing mathematical communication skills.
- Encourage and motivate students to confidently express their ideas and present problem-solving approaches orally to their peers.

International Journal of Education and Social Science Research

ISSN 2581-5148

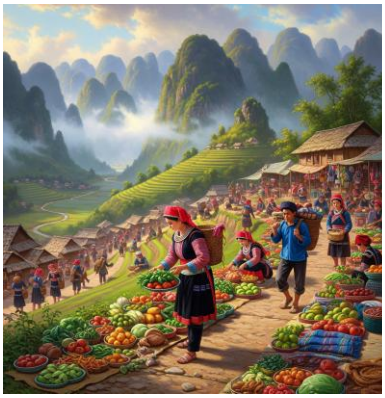
Vol. 8, Issue.4, July-Aug 2025, p no. 292-301

*d) Illustrative example*

**Example:** Developing communication skills in mathematical language for ethnic minority students when solving the following problem:

"On Market Day, Mother brought 86 chicken eggs to sell. She sold 7 dozens of eggs. How many eggs does she have left?"

Calculation: ..... Answer: Mother has ..... eggs left.



periodic market

**Analysis:** The problem is set within a familiar cultural context for students in mountainous regions. The periodic market (Chợ phiên) is a distinctive cultural activity among ethnic minority communities. It is not only a place for exchanging goods but also a venue for social gatherings and cultural exchange.

**Step 1.** Organize for students to read the mathematical content and identify the vocabulary of mathematical language present.

Students read the problem silently and answer the questions: *"What information is given in the problem?"* and *"What is being asked?"*

Students work in pairs, with one asking and the other answering, then switch roles.

- *Given information:* "On Market Day, Mother brought 86 chicken eggs to sell. She sold 7 dozen of eggs."
- *Question:* "How many eggs does she have left?"

Students underline key mathematical terms in the text: "On Market Day, Mother brought 86 chicken eggs to sell. She sold 7 dozen of eggs. How many eggs does she have left?"

Students identify the relevant mathematical vocabulary: "dozen," "86" — indicating a subtraction problem with the meaning "to remove" or "to take away."

**Step 2.** Use mathematical language in the process of problem-solving.

From the identified terms, symbols, and keywords, students determine the solution. They recognize that 1 dozen = 10 units, thus 7 dozens = 70 eggs. Given the problem's context, students understand that initially there were 86 eggs, and Mother sold 70 eggs. Therefore, to find the remaining eggs, they subtract the number sold from the initial number.

**Step 3.** Present the solution using mathematical language.

Students use mathematical notation to write the calculation and complete the answer:

Convert: 7 dozens = 70 eggs.

Calculation: 86 – 70 = 16

Answer: Mother has 16 chicken eggs left.

Whole-class activity: A student representative presents the solution and explains the reasoning behind the subtraction 86 – 70.

International Journal of Education and Social Science Research

ISSN 2581-5148

Vol. 8, Issue.4, July-Aug 2025, p no. 292-301

### 3.3. Designing and Organizing Activities for Applying Mathematical Knowledge to Solve Real-life Situations

*a) Purpose of the measure*

This measure aims to help students:

- Recognize that mathematics exists in daily life, in their surrounding environment, and that mathematics serves real-life purposes.
- Apply acquired mathematical knowledge to solve problems arising in real-world contexts.
- Have opportunities to practice and develop mathematical language while solving real-life problems.

*b) Implementation steps*

**Step 1:** Design exercises and construct situations connected to real-life contexts.

**Step 2:** Practice solving real-life problems.

**Step 3:** Use mathematical language to describe similar real-life situations.

*c) Implementation notes*

- When designing situations or problems linked to real life, select contexts familiar and relevant to students' daily experiences.
- Ensure that the proposed situations and problems require the application of mathematical knowledge the students have learned.
- Create learning activities that allow students to develop mathematical language during the learning process.

*d) Illustrative example*

*Example:* Designing and organizing activities for applying knowledge of numbers within the range 0–10 to solve real-life situations.

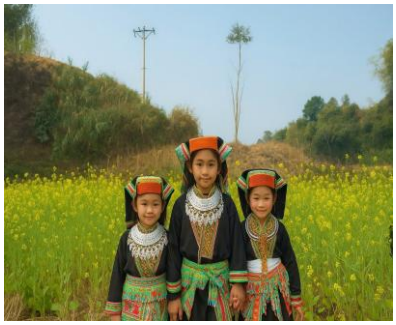
**Step 1:** *Design exercises and construct situations connected to real life.*

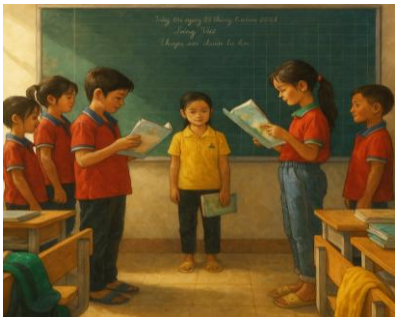
The teacher designs exercises requiring the application of knowledge about numbers within 0–10, such as recording the number of classmates who are playing or studying, the number of objects in the classroom or at home, or the number of domestic animals.

The designed problems help students practice counting, reading, and writing numbers within 0–10 while providing opportunities to use Vietnamese in combination with mathematical language when solving problems.

**Problem 1:** How many students are there in each picture?

Bài 1. Mỗi bức tranh có bao nhiêu bạn học sinh?





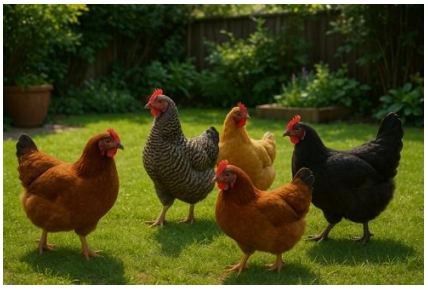
International Journal of Education and Social Science Research

ISSN 2581-5148

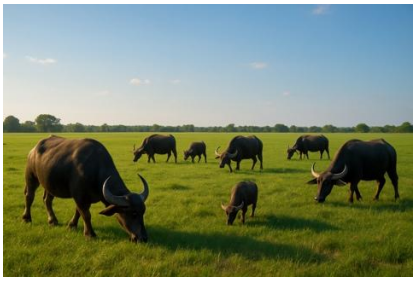
Vol. 8, Issue.4, July-Aug 2025, p no. 292-301

… students … students … students

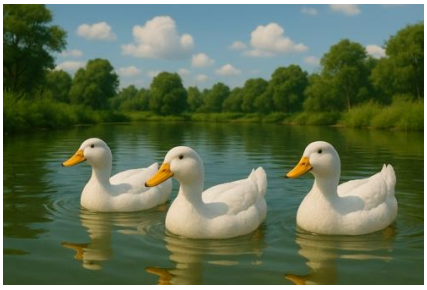
**Problem 2:** Observe the pictures and complete the blanks: Write the number:



Write the number: .....
Read the number: .....



Write the number: .....
Read the number: .....



Write the number: .....
Read the number: .....

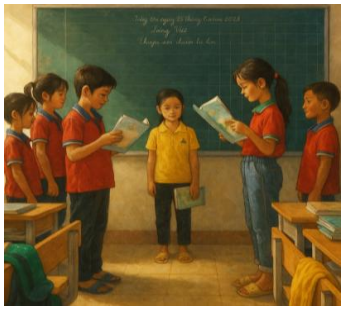
**Step 2:** *Practice solving real-life problems.*

For Problem 1, students read the requirement and observe each picture to find the answer: The first picture has 3 students, the second has 6 students, and the third has 4 students.

Pair work: Students tell their partner the answer. While speaking, they count the number of students in each picture. Encourage them to describe in Vietnamese what the students in the picture are doing.

Whole-class activity: Representatives share the number of students in each picture, and the teacher asks them to write the corresponding numeral.

3 students



6 students

4 students

For Problem 2, students observe the pictures and describe them to their partner. For example, in the first picture, they may say there are 5 chickens; in the second, there are 7 buffaloes grazing in a field; in the third, there are 3 ducks swimming in the water.

Have students write the mathematical information they can read in the blanks as required. Then, students can write the numbers and read the numbers corresponding to the number of each animal in the picture.

Students complete the exercise and share their answers with a partner.

**Step 3:** *Use mathematical language to present a similar real-life situation.*

The teacher guides students to describe situations in real life that involve numbers within the range 0–10. For example: “My family has 2 dogs”; “Our classroom has 4 windows”; “There are 6 people in my family.”

## III. CONCLUSION

ISSN 2581-5148

Vol. 8, Issue.4, July-Aug 2025, p no. 292-301

In teaching *Numbers and Operations* to Grade 1 ethnic minority students, teachers should place great emphasis on the formation and development of mathematical language. Teachers need to support students in overcoming barriers related to the Vietnamese language as well as challenges in mathematical language, thereby enabling more effective learning in Mathematics. Teachers should design learning situations that are closely connected to the students' numerical environment. On that basis, they should organize learning activities that create opportunities for the development of mathematical language among Grade 1 ethnic minority students, contributing to the improvement of their mathematical learning outcomes.

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