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IMPROVING EXPRESSION ABILITY OF DIFERENT LANGUAGE FORMS FOR ELEMENTARY STUDENTS THROUGH MATHEMATICS PROBLEM-SOLVING INSTRUCTION

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Abstract. Developing language for students is an important task of teaching. Mathematics language has its own characteristics and advantages, which play an important role in mathematics learning. Morover, the development of mathematics language competence will contribute to the language development of students. This paper aims to discuss some language forms used in teaching mathematics in elementary schools and propose some measures for developing language expression ability for students through mathematics problem solving instructions.

Keywords: Language competence, mathematics language, mathematics forms, mathematics problem solving, elementary school students.

1. Introduction

Language is the reflection of thinking, the development of language for students, especially for elementary students, on that basis, it will contribute to their thinking development. At elementary level, students receive basic scientific knowledge through exploring the world. Thus, language plays a major role in conveying knowledge through their cognitive processes. In the general education program officially announced by the Ministry of Education and Training in July 2017, language competence is one of the specialized competences that needs to be developed for students.

Literature review presents studies and research results relating to the development of mathematics language for school students such as: measuring to develop or train the mathematics language competence for elementary school students [1], [2], [3], [7]; examples in teaching a particular piece of knowledge at elementary level to enhance mathematics language competence for students [8], [9]; researches of mathematics teaching aiming at improving mathematics language use ability [5]; challenges in terms of language in mathematics teaching and learning [10]; researches in mathematics teaching in a multi-language class or second language-based mathematics class (such as teaching mathematics using English for students from non-English regions) [10], [11]. This paper, however, presents some suggestions and directions to assist teachers to improve the expression skills of different language forms for elementary students through mathematics solving problem instructions - important activities in the mathematics learning process.

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2. Content

2.1. Language forms used in teaching mathematics at elementary schools

2.1.1. Spoken language

Spoken language is one of the two primary language forms in communication. At elementary level, most students are fluent at using oral language. In the teaching process, teachers can check children's understanding as well as elicit their difficulties, thoughts and views on a certain issue through their verbal communication. Through subject teaching at elementary schools in general, and mathematics in particular, students' spoken language is improved through the presentation of their ideas in front of the group/class, in answering the teacher's questions about the lesson, in sharing ideas, or presenting assignments in group or in class.

2.1.2. Written language

Along with spoken language, students' written language is gradually formed and developed in the learning process at schools. At the final grade, the written language of elementary school students is fluent, towards the perfection of grammar, spelling, and phonetics. Through mathematics learning, elementary students gradually become familiar with presenting the solution to mathematical problems in a logical order, which are as simple as when they rewite given samples, or as complicated as when they self-present solution to the problem, especially mathematics problems involving words.

2.2. Mathematics language forms

Mathematics language is a system of terms and mathematics symbols, mainly in the form of written language. These symbols are conventional in order to express mathematical content that is logical, accurate, and concise [1].

Mathematics language is different from natural language. Mathematics language is more compact than natural language because it mainly uses alternative symbols (mathematics symbols, diagrams, graphs, and illustrations) to express the presented content. Moreover, each mathematics symbol or the combination of mathematics symbols has only one meaning, which makes the mathematics language be capable of expressing mathematics thought more precisely than natural language. The mathematics symbols in the elementary mathematics program can be divided into groups of quotation symbols (plus "+", minus "-", multiple "x", divide ":"), or groups of relationship symbols (greater than ">", smaller than "<", equal to "=",...).

Mathematics language activities can be performed at anytime in the learning process of mathematics for elementary students. Students should be instructed to gradually improve their ability in integrating their oral language, natural language and mathematics language during the process of mathematics teaching and learning.

2.3. Teaching and learning mathematics problem-solving in elementary schools

Mathematics problem-solving instruction is an activity aimed at developing the content of knowledge circuits in the mathematics curriculum in elementary schools. This content is integrated into new and practical lessons in all circuits like arithmetic knowledge, quantity and quantity measuring, geometry, etc., through grade 1 to 5 with the gradually increasing amount of knowledge and levels.

Through mathematics problem-solving instructions at elementary schools, teachers may help students to practice, consolidate, enhance calculating skills, and apply knowledge into practice so as to develop the thinking competence of students, and sharpen their way of thinking and reasoning as well as their ability to observe, compare, analyze, synthesize, explore, and create...

Mathematics problem-solving teaching does not only mean providing students with the problem solution but more importantly, assisting students to know how to solve the problems. Therefore, the mathematics problem-solving instruction should equip students with instructions and suggestions so that they know how to think and analyze the problem to find out the solution. According to Nguyen Ba Kim [6], based on general ideas along with the detailed suggestions of Polya, the general process for solving a mathematics problem should follow four steps.

Step 1. Explore the content of the problem

In this step, students carefully read the mathematics problem. Then, they can restate the problem in different ways to understand the problem content: determine what is given, what must be found or proven; use formulas, symbols, and graphics to support the description of the problem.

Step 2. Find out a solution

In this step, students explore the solutions through speculative inferences: transform the given, what to be found or proven, relate the given to what to be found with already known knowledge, and relate the solving problem to a similar former problem, a particular case or a more general case or use specific methods for each type of mathematics problems.

Step 3. Present the solution

Basing on the solution that has been found, students rearrange the steps to be done in a process with appropriate order and perform those steps.

Step 4. Reflection

In this step, students consider the applicability of the solution, find solutions for similar problems, expand or reverse the problem to develop the problem.

It should be noted that some problems do not necessarily follow in the above steps, but the implementation of these suggestions will help learners find the direction, find solutions to the problem or explore and expand that problem.

2.4. Some measures for improving expression ability of different language forms for elementary school students through mathematics problem-solving instructions

2.4.1. Using Q & A method, building a friendly learning environment, creating opportunities for students to present, discuss, and comment... in the process of understanding problems and method of solving mathematics problems

a) Purpose and requirements: As the all competencies, the expression competency of different language forms of elementary school students is formed through long-term training. Therefore, it is very important to build the learning environment and create opportunities for students to practice their expressive skills. The communication between teachers and students in schools aims at conveying and helping them to acquire scientific knowledge, life experience, skills, techniques, careers, thereby shaping and developing goodpersonality of the students. Through the development and use of appropriate Q & A items, this method focuses on improving the oral language for elementary school students in the process of teaching mathematics problems.

b) Procedure: Through the process of giving instruction to understand mathematics problems and finding the solutions, teachers can communicate with students by guiding, raising the problems, and posing questions about the problems while students answer teacher's questions in performing problem solving process to develop their ability to express their languages.

Example: *There are two barrels of oil, the first one contains 15 liters of oil, the second one has 27 liters of oil. The oil is equally divided into different bottles containing 0.75 liters of oil each. How many bottles of oil will be then*?

With this problem, after asking the students to think about the task carefully, the teacher can use Q&A method to ask the students to answer such questions as:

1. What are already known ?

2. What must be found out?

Students will give their opinions, comment on their classmates' answers, self-assess and find the solutions by themselves.

Answer 1: The first container contains 15 liters of oil, the second container has 27 liters of oil, the oil is equally divided, each bottle contains 0.75 liters of oil.

Answer 2: How many bottles of oil are there?

During the question-and-answer process between the teacher and the student to find out what have been given and what must be found out, the teacher can raise extra guiding questions to assist students to understand the content and requirements of the problem.

Once the student has learned the content and requirements of the mathematics problem, teacher continues to ask students to write a summary of the problem. This can be done by underlining keywords of the problem or rewriting key information. This requirement helps students better understand the problem, ignore the unnecessary words and help students gradually get acquainted with the short, clear but accurate writing in mathematics.

In the next step, teachers can ask questions to guide students to find the direction to the solutions:

Do you know the amount of oil in the two barrels? (the oil amount must be known)

How could you know the amount of oils then? (total amount of oil is divided by the amount of oil in each bottle to find the number of oil bottles)

In order to exploit and expand the problem, the teacher can ask the student to show the relationship between the number of bottles and the amount of oil contained in a bottle through the different supposed cases. For instance, how many bottles of oil will be needed if each bottle contains 1 liter of oil? How many bottles will be needed to store all the oil if each contains 0.5 liter?

In this process, teachers should always create a friendly and cooperative atmosphere between teachers and students, students and students, helping students feel "safe", confident, and happy to express their opinions, give comments, self-evaluate, evaluate your opinions, and choose a reasonable method of solving mathematics problems. Respecting and encouraging students to participate in the process of solving mathematics problems through the support of the question-and-answer system will help students to have the opportunity to experience and practice their oral language.

2.4.2. Improving presentation skills of mathematics problems for elementary school students in the process of teaching mathematics problems

a) Purpose and requirements: In the 4-step process of solving mathematics problems, after conducting the problem solving, analysis and finding solutions, students step into presenting solutions. Presenting a solution to a problem is a form of applying known knowledge to specific problems, which is the best way to practice such skills as calculation, transformation, reasoning and ability to use written language for students. Through checking the solution of students' problems, teachers can assess students' ability, the level of acquiring and apply their knowledge as well as their ability to use written and mathematical languages.

This measure focuses on training the written language and mathematical language for elementary students in the process of teaching mathematics problems.

b) Procedure: In reality, many students do not care about the presentation step as they try to present the solution in their ways of thinking and their understanding, resulting in illogical solutions. Many students have been able to identify the key points, the direction to solution after the analysis of the problem. However, what challenges them is that they do not know where to start presenting the solution whereas some even commit errors. The following procedure can be applied in order to develop the problem-solving presenting-skills:

- Step 1: Instruct students to find methods to solve problems.

- Step 2: Teacher presents a sample of problem solution and analyzes the points that students need to pay attention to learn how to present the solution. This is an important activity, especially for elementary students. Then, for each type of mathematic, teachers need to present the standard solution (maybe through a number of solutions for a number of different problems of the same type), analyze each deductive step from which students observe, study and follow. It should be noted that the goal of the teacher demonstration is not only the application of the students into similar mathematics problem form, but a concentration on improving the skills of thinking and ordering their reasoning accurately, properly and scientifically.

- Step 3: Give suggestions, and instructions that are incomplete and ask students to complete and restate the solution of the problem.

- Step 4: Students present the solution themselves

- Step 5: Comment, evaluate

Example: A rectangular-shaped landplotis 200m in length, and its width is $\frac{3}{4}$ of its length. Calculate the area of the landplot?

With this problem, from the analysis of what are known, what must be found and the relationship between them, students learn that the area of the rectangular-shaped landplot can be calculated if its length and width are known. Teacher can ask students to answer the following questions to complete the solution:

- What is the length of the rectangular-shaped landplot? (200 m)

- What is the width of the rectangular-shaped landplot? (can be calculated based on the length)

- What is the area of the rectangular-shaped landplot? (the length multiples the width)

2.4.3. Training expressive skills for elementary students through finding and correcting errors in mathematics problem-solving.

a) Purpose and requirements: While presenting the solution, students may encounter errors, even mistakes in the solution. Detecting and correcting these errors not only help them complete their work, but also help them avoid similar mistakes. At the same time, through analyzing and correcting errors in presenting the solution of students' problems, teachers can help them practice their language expression skills.

This measure focuses on training the written language and mathematical language for elementary students.

b) Procedure: Teachers let students check and find errors in their solutions, comment on their peer’s solution or look for errors (if any) in the given solutions.

For instance: Teachers may ask students to find the mistakes (if any) in a student's answer, as follows:

Problem: 32 kg of vegetables were harvested in the first garden, the second garden yielded three times as much as the amount of vegetables of the first garden. Each kilogram of vegetables could be sold at 15,000 VND. How much could be earned from the vegetables of both gardens?

Vegetables harvested in the second garden is:

32 x 3 = 96 kg

Vegetables harvested in both gardens is:

32 + 96 = 128 kg

Money earned from the vegetables is

128 x 15 000 = 1 920 000 VND

Answer: 1 920 000 VND

In the above solution, there are some contents needed to be corrected. The expressions as *Vegetables harvested in the second garden is* or *Vegetables harvested in both gardens is* are incorrect as these mention the amount of vegetables harvested. Therefore, the correct ones should be *The amount of vegetables harvested in the second garden is* or *The amount of vegetables harvested in both gardens is*. The next expression *Money earned from the vegetables is* should also be corrected into *The amount of money earned from the vegetables is.* Besides the measurements should be put into parentheses such as (kg), (VND) except the in the answer, Teachers should instruct students to find out their errors and withdraw their own experiences for the next performances.

2.4.4. Exploring some advantageous mathematics problem form for the development of students' language and language expression ability.

a) Purpose and requirements: In teaching mathematics problems, in-depth study of problems, exploitation of problems helps students master and deepen knowledge of mathematical skills, and also helps to develop mathematics learning ability and expressive ability for students. This measure aims to train the synthesis of languages used in teaching mathematics in primary schools.

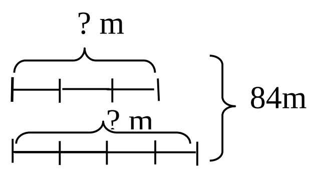
b) Procedure: At elementary level, there are a number of mathematics forms which can be utilized to improve students' ability to present, express and develop their language such as verbal mathematics problems, information filling problems, multi-solution mathematics problems, mathematics problem using diagrams, etc.

The following is an illustration of the type of problem requiring students to set up the problem themselves and solve the problem basing on given data.

Write down the problem basing on the given data, then present your solution.

.... :

.... :



At this stage, students are put in a problematic situation, in which they do not go straight to the solution but analyze the problem, given data, and their relationship in order to be able to 'compose' the problem first. Normally, students are accustomed to confront with a verbal language mathematics problem associating with the actual content expressed, they only have to find the solution as required. However, in this case, the exercise just gives data with some information about the relationship between the quantities, and requires students to use appropriate language to set up various problems before solving. They have to find ways to express the problem tightly attached to the given diagram for both mathematical and practical requirements. A variety of problems can be posed basing on the given data.

The followings are some of student's proposed mathematics problems:

(1) A rectangular shaped garden has a half-perimeter of 84m. Calculate the length and width of the garden, given that the width of the garden is $\frac{3}{4}$ of its length.

(2) A rectangular shaped garden has a half-perimeter of 84m. Calculate the area of the garden, given that the width of the garden is $\frac{3}{4}$ of its length.

(3) One team dug a 84 m long ditch in two days. Due to technical innovations, the ditch was dug more $\frac{4}{3}$ than that of the first day. Calculate the length of ditch that the team dug each day.

Thus, 'composing' the mathematics problems basing on given data does not only help students to develop their thinking, imagination, creativity but train their language use, symbol and language transformation, application of the learned knowledge. More importantly, it encourages students to move from passive state (waiting for the problems given by teacher) to a more active mood (getting the task, set up the problem, then solve).

3. Conclusion

Language development is one of the primary goals in elementary education. Among various subjects, mathematics is a potential subject that equips students with both knowledge and skills, contributing to the development of language for students. Through mathematics problem-solving instructions in elementary schools with a number of specific suggestions, teachers are able to toutilize and design their teaching activities in order to improve students' mathematics language competence in particular and language competence in general.

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