

**MINISTRY OF EDUCATION AND TRAINING
THE VIETNAM INSTITUTE OF EDUCATION SCIENCES**

TRAN NGOC BICH

**SOME MEASURES TO HELP FIRST
GRADES STUDENTS IN PRIMARY SCHOOLS
USE EFFECTIVELY THE LANGUAGE
OF MATHEMATICS**

Major: Theory and Methodology in Teaching Mathematics

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ABSTRACT OF PH.D. EDUCATION SCIENCE DISSERTATION

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Supervisor: 1. Assoc. Prof. Dr. Do Tien Dat
2. Dr. Tran Dinh Chau

Reviewer 1 : Prof. Dr. Nguyen Ba Kim
HaNoi National University of Education

Reviewer 2: Prof. Dr. Dao Tam
Vinh University

Reviewer 3: Assoc. Prof. Dr. Dao Thai Lai
The VietNam institute of Education sciences

The thesis is defended before the juridical board at the Institute level at
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PREFACE

1. REASONS FOR CHOOSING THE TOPIC

Mathematics is not only to equip students accurate mathematical knowledge, but “to form methods of thinking and working of mathematical sciences in students” [36, p. 68]. Moreover, “one of the basic ideas of humanising mathematics in the schools is: mathematics for everyone or for each individual, not just for some people” [34, tr.152]. In primary education, Mathematics provides students the initial basic knowledge, which is simple but the basis for subsequent learning process. Teaching Mathematics in primary schools is divided into two phases: the first grades (grades 1, 2, and 3) and the senior grades (grades 4 and 5) [4, p. 40-41].

In teaching Mathematics, two languages are used at the same time : natural language and the language of mathematics. There is no clear-cut boundary between natural language and the language of mathematics but they are “intertwined” together. Therefore, in teaching Mathematics, teachers not only impart mathematical knowledge but also form, develop the language of mathematics, and train and develop natural language (Vietnamese) for students.

The language of mathematics play an important role in the development of mathematical thinking as well as in mathematical presentation and reasoning. Therefore, in the world there have been many educators studying the language of mathematics and its effects on students’ learning outcomes. The language of mathematics also is concerned and mentioned in the secondary mathematics programs and textbooks in many countries around the world, such as Norway, England, Sweden, and Romania [84].

In Vietnam there have been some educators studying the issues on the language of mathematics and the language of mathematics in Mathematics in primary education. The results of those studies are just at the initial study of theory on the language of mathematics, there have been no specific studies on the effects of the language of mathematics on the acquisition of the new knowledge in mathematics learning of secondary students in general, and primary students in

particular; the difficulties in terms of the language of mathematics that students encounter in learning Mathematics; and no specific proposals to help students effectively use the language of mathematics.

In practical teaching, many teachers do not really care and create learning environments in which students are formed and practised using precisely the language of mathematics. Teachers do not have measures to help students effectively use the language of mathematics in learning mathematics. Therefore, the research suggesting measures for effective use of the language of mathematics for primary students in general and first-grades students in particular has practical significance.

Starting from the above reasons we selected research topic *“Some measures to help first-grades students in primary schools use effectively the language of mathematics”*

2. AIMS OF THE STUDY

On the basis of theoretical studies on the language of mathematics, empirical research on the use of the language of mathematics in teaching Mathematics in primary schools, the author proposes some pedagogical measures to help first-grades students in primary schools use the language of mathematics effectively.

3. OBJECTS AND SUBJECTS OF THE STUDY

- Objects: The process of teaching Mathematics in Grade 1, Grade 2, and Grade 3.

- Subjects: The language of mathematics in the first grades in primary schools (Grade 1, Grade 2, and Grade 3).

4. RESEARCH HYPOTHESIS

If we build and implement some pedagogical measures, the teachers can help first-grades students in primary schools use effectively the language of mathematics contributing to the improvement of the quality of teaching Mathematics in Grade 1, Grade 2, and Grade 3.

5. RESEARCH TASKS

- To research theories on the language of mathematics.

- To research contents, programs of Mathematics in primary education.

- To research the language of mathematics in Math textbooks of the first grades in primary education.

- To research the development of thinking and language of primary students.

- To research the actual use of the language of mathematics in teaching Mathematics in primary education.

- To propose pedagogical measures to use the language of mathematics effectively for first-grades students in primary schools in teaching Mathematics.

- To carry out pedagogical experiments to test effectiveness and feasibility of proposed pedagogical measures.

6. SCOPE OF STUDY

The dissertation focuses on studying the actual use of the language of mathematics in teaching Mathematics of first grades in primary education.

7. RESEARCH METHODOLOGY

7.1. Theoretical methodology

7.2. Experimental methodology

7.3. Information processing methodology

8. CONTENTS FOR DEFENSE

Some pedagogical measures to help first-grades students in primary schools use effectively the language of mathematics in proportion to the proposed levels.

9. NEW FINDINGS OF THE DESSERTATION

Having partially systematised theories on the language of mathematics.

Having analysed the language of mathematics in Math textbooks of the first grades in primary schools.

Having investigated the actual use of the language of mathematics in teaching Mathematics in primary schools today.

Having developed must-achievement-levels of using effectively for students of Grade 1, Grade 2 and Grade 3.

Having proposed some measures to help first-grades students in primary schools use effectively the language of mathematics.

10. THEORETICAL AND PRACTICAL SIGNIFICANCE OF THE DESSERTATION

10.1. Theoretical significance

Systematising theories on the language of mathematics.

10.2. Practical significance

- Analysing actual use of the language of mathematics in teaching Mathematics in primary education today.
- Proposing levels and measures to help students of Grade 1, Grade 2, Grade 3 use effectively the language of mathematics.

11. STRUCTURE OF THE DESSERTATION

Apart from the “Introduction” and “Conclusion” the main contents of the dissertation include:

Chapter 1. Theoretical background and practice

Chapter 2. Some measures to help students of Grade 1, Grade 2, and Grade 3 use effectively of the language of mathematics.

Chapter 3. Pedagogical experiments

Chapter 1

THEORETICAL BACKGROUND AND PRACTICE

1.1. Literature review

1.1.1. In the world

According to [77, tr.39 - 52] the language of mathematics has significant contribution to students’ Mathematics learning. In 1952, Hickerson has studied the significance of the arithmetic symbols formed in Math class of students. However, this study was not concerned until the 1970s that the language of mathematics was initially studied systematically in relation to natural language.

Martin Hughes (1986) studied the difficulties in terms of the language of mathematics namely arithmetic symbols in children's mathematics learning [75, tr.113 - 133].

According to [56], the Pimm (1987), Laborde (1990) studied the language of mathematics in students’ Mathematics learning and found that the language of mathematics really a barrier in learning mathematics.

Rheta N. Rubenstein (2009) studied mathematical symbols found that symbols were an important factor of the language of mathematics in Mathematics learning at all study levels. [79].

Charlene Leaderhouse (2007) studied the language of mathematics and the understanding of 6th grade students about the language of mathematics in learning Geometry [55, p. 8-10].

Diane L. Mille (1993) studied the role of the language of mathematics in the development of mathematical concepts and the connections of language as English as a second language of learners [59, tr.311-316].

Eula Ewing Monroe and Robert Panchyshyn (1995) studied the vocabulary of the language of mathematics and pointed out the necessity of vocabulary of the language of mathematics in developing mathematical concepts [61, tr.139 - 141].

Sullivan.P and Clarke.D (1991), Dean.PG (1982), and Shuard.H Torbe.M (1982) studied the communication using the language of mathematics in students' Mathematics learning [p. 70].

Besides, there have been many researchers interested in the language of mathematics and its effects on students' Mathematics learning like Marilyn Burns HS (2004) [73], Raymond Duval (2005) [78], Robert Laurence Baleer (2011) [80], Chad Larson (2007) [54],

1.1.2. In Vietnam

Pham Van Hoan, Nguyen Gia Cups, Tran Thuc Trinh (1981) stated "the right presentation/realization of the relationship between mathematical ideological contents and the language of mathematics form is the important methodological basis of mathematics education" [31, p. 94-96].

Ha Si Ho (1990) presented a number of characteristics of the language of mathematics [17, tr.43 - 48].

Hoang Chung (1994) studied the language of mathematics and the use of the language of mathematics in Mathematics textbooks of lower secondary schools [10, p. 8 - 16].

Ha Si Ho, Do Dinh Hoan, Do Trung Hieu (1998) argued that the symbols are arranged according to the "grammatical rules" to form expressions or formulas presenting objects or mathematical propositions [18, p. 23-26].

Nguyen Van Thuan (2004) proposed pedagogical methods to help first-grades students of high schools use accurately the language of mathematics in learning algebra [44, p. 82-135]

In summary, in the world, the language of mathematics, its roles and effects on the learning process of the students have been interested by many researchers. In Vietnam, the language of mathematics initially mentioned, but there have been no scientists and scientific research studying deeply and comprehensively this issue in terms of both theory and practice.

1.2. A brief introduction to language

1.2.1. Concepts

1.2.2. The fundamental functions of language

1.2.3. Scientific terminology

1.3. The language of mathematics

1.3.1. Concepts

1.3.1.1. Concepts of the language of mathematics

The language of mathematics include symbols, terminologies (words and phrases), icons and rules for combining them as a means to express mathematical contents in a logical, accurate and clear way. Icons include images, drawings, diagrams or models of specific objects. The symbols consist of numbers, letters, alphabetic characters, arithmetic signs, relationship signs, brackets used in mathematics.

1.3.1.2. The concepts of effective use of the language of mathematics

For primary students, effective use of the language of mathematics means using correctly and accurately symbols, icons, terminologies in receiving new knowledge or in doing exercises and using the language of mathematics as a means to express in spoken or written language accurately, flexibly, and clearly in learning Mathematics.

1.3.2. The function of the language of mathematics

1.3.2.1. Communication functions

Communication is an important function in learning, teaching and researching mathematics. In Math classes, there is a lot of information to be exchanged between the teachers and students as the whole, and between teachers with individual students, and between

individuals with students as the whole, and between individuals with individuals. The forms of communication that takes place in Math classes aims to solve posed mathematical problems to help students understand mathematical concepts, and improve the ability to understand and use the language of mathematics.

1.3.2.2. Thinking functions

In the language of mathematics, there is no mathematical symbols and terminologies without expressing concepts or ideas of mathematics. Vice versa, there is no thoughts and ideas that are not expressed by the language of mathematics.

Besides, the language of mathematics is engaged in thinking processes to solve a math problem or in other words, the language of mathematics it is involved in the formation of mathematical ideologies.

1.3.3. The development of the language of mathematics related to General mathematics at a glance

1.3.4. Aspects of study the language of mathematics

1.3.4.1. Vocabulary

The set of symbols, the terminologies (words, phrases), icons used in mathematics is called vocabulary of the language of mathematics.

1.3.4.2. Syntax

Syntax of the language of mathematics can be defined as the rules for combining symbols, words, phrases to form mathematical expressions or formulas to convey mathematical contents with high precision.

1.3.4.3. Semantics

Semantics of the language of mathematics can be defined as the meaning or content of symbols, terminologies (words, phrases), and icons... in mathematics.

1.4. Mathematical thinking

1.4.1. Concepts of mathematical thinking

1.4.2. Operations of mathematical thinking

1.5. The development of thinking and language of primary students

1.5.1. The development of thinking

1.5.2. The development of language

1.6. Curriculum and Mathematics textbooks of first grades in Primary education

1.6.1. Mathematics curriculum in Primary education

1.6.1.1. Position

1.6.1.2. Aims

1.6.1.3. Contents

Mathematics curriculum in Primary education includes mainstream of 4 key issues:

- Arithmetic.
- The quantity and quantity measurement.
- Geometry factor.
- Solve math problems with the text.

1.6.1.4. Teaching methodology

1.6.1.5. Assessment of students' learning outcomes

1.6.2. Mathematics textbooks of first grades in Primary education

1.6.2.1. Characteristics

1.6.2.2. The language of mathematics in Mathematics textbooks: Math 1, Math 2 and Math 3

a) Vocabulary of the language of mathematics in Mathematics textbooks: Math 1, Math 2 and Math 3

b) Syntax of the language of mathematics in Mathematics textbooks: Math 1, Math 2 and Math 3

c) Semantics of the language of mathematics in Mathematics textbooks of first grade in Primary education

1.7. The actual use of the language of mathematics in teaching Mathematics in Primary schools now

1.7.1. Aims of the survey

1.7.2. Objects of the survey

1.7.3. Contents of the survey

1.7.3.1. Contents of the survey for teachers

- Remarks and assessments of teachers on the language of mathematics in the Mathematics textbooks in Primary education now and the necessity of training the language of mathematics for students.

- The situation of training and development the language of mathematics for students in teaching Mathematics in Primary education now.

- Difficulties with the language of mathematics in teaching Mathematics in Primary education.

- Assessment of teachers on the usage level of the language of mathematics of primary students today.

1.7.3.2. Contents of the survey for students

- The reading and writing the language of mathematics of first-grades students in primary schools.

- The use of the language of mathematics in practising calculations.

- The shift between languages in the learning of students.

- The use of spoken language of students in learning Mathematics.

1.7.4. Survey methods

1.7.5. Survey results

1.7.5.1. Survey results from teachers

1.7.5.2. Survey results from students

1.7.6. Conclusions about the actual use of the language of mathematics in teaching Mathematics in primary schools today

- Teachers have paid attention to training and development of the language of mathematics for students in teaching Mathematics, but there are not really effective measures to help students use the language of mathematics effectively.

- Students use the language of mathematics at moderate level.

The causes of these problems are because the teachers do not have a really effective measures to help students form a steady foundation of the language of mathematics; students have not trained to use the language of mathematics in an effective way in learning; students do not have skills for using the language of mathematics in communication.

CONCLUSIONS OF CHAPTER 1

The language of mathematics has effect on the quality of teaching Mathematics in general, and Mathematics of first grades in Primary education in particular. Thus, in order to improve the quality of teaching Mathematics of first grades in Primary education, it is necessary to have measures to help students use the language of

mathematics effectively. Therefore, the dissertation should research and propose measures to address the following issues:

- To develop a steady set of the language of mathematics for students: They understand, read, write properly the correct mathematical symbols and terminologies.

- To train students to use accurately the language of mathematics in learning Mathematics: Students use correctly and accurately the language of mathematics in solving mathematical issues.

- To develop communication skills using the language of mathematics for students through four skills: listening, speaking, reading, and writing: Students present issues with spoken language and written language coherently and logically; understand of mathematical contents heart and read.

Chapter 2

SOME MEASURES TO HELP STUDENTS OF GRADES 1, GRADE 2, GRADE 3 USE EFFECTIVELY THE LANGUAGE OF MATHEMATICS

2.1. Principles for building and implementing measures

2.2. The levels of effective use of the language of mathematics

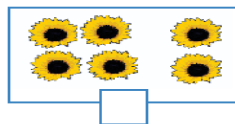
Level 1:

Basis: At this level, students have had background of the language of mathematics. They have acquired mathematical symbols and terminologies and understand the syntax of the language of mathematics.

To help students use effectively the language of mathematics at level 1, students need to achieve the following:

- *To use the correct mathematical symbols and terminologies in a simple form.*

For example: When students learn number 6, they have to read, write its symbol precisely, and use correctly number 6. For instance, students look at the painting and can count that there are 6 flowers, then the student must write correctly number 6 in the box.



- To combine precisely mathematical symbols in the simple form.

Level 2:

Basis: Students have used correctly and precisely mathematical symbols and terminologies, combined properly mathematical symbols in a simple form.

To help students use the language of mathematics effectively at level 2, students must meet the following requirements:

- To combine correctly and accurately mathematical symbols in the complex forms.

- To use correctly mathematical symbols to record simple math contents conveyed through visual images.

Level 3:

Basis: Students use correctly and accurately mathematical symbols in the complex forms; Initially they can read and understand mathematical contents through drawings, diagrams, visual images and use mathematical symbols to present that contents.

To achieve level 3, that students use the language of mathematics must meet the following requirements:

- To read and understand correctly mathematical contents and express in written language or diagrams, drawings. In addition, they have to use the language of mathematics to present mathematical problems in written language in a coherent, logical and accurate way.

- To use the language of mathematics to listen, and to understand what other people say and presents mathematical problems for other people to understand.

2.3. Some measures to use the language of mathematics effectively

2.3.1. Group 1 of measures: Organizing for students to develop their knowledge of the language of mathematics

Measure 1: To form vocabulary and semantics of the language of mathematics for students

a) The purpose of the measure

The measure is used to:

- Help students acquire vocabulary and semantics of mathematics effectively.

- Help students understand and grasp vocabulary, semantics of the language of mathematics and use them effectively in learning.

- Contribute to enriching the language in general and the language of mathematics in particular.

b) Contents and procedures to implement the measure

Step 1: Introducing mathematical symbols and terminologies

Step 2: Receiving semantics of the language of mathematics

Step 3: Using mathematical symbols and terminologies

c) Notes on measure implementation

d) Example

Example: *Form of terminologies and semantics of the language of mathematics for students when teaching the lesson on “Numerator - Denominator – Quotient” (Math 2, p. 112)*

Step 1: Introducing mathematical terminologies

Teachers carry out the following activities:

- Teacher write on the blackboard the division $6:2=3$ and ask questions.

- Teachers introduce: In the division $6:2=3$, 6 is the numerator, 2 is the denominator, 3 is the quotient. Teachers ask students to recall components of the division.

Step 2: Receiving semantics of the language of mathematics

Through practical activities, students will understand the numerator is the first number standing in the division and before the division mark; Denominator is behind Numerator; quotient is the result of the division standing behind the equal sign.

Step 3: Using mathematical terminologies

- Teachers organise the whole class activities, call out students to make examples, other students point out components of calculations, and the meaning of each component.

- Teachers ask students to work in pair discussion with request:: A student gives an example of the division, the other student works out the result and identify the components of the calculation, then exchange the tasks to each other.

Measure 2: To organise for students to acquire syntax of the language of mathematics

a) The purpose of the measure

The measure is used to help students:

- Acquire and write correctly mathematical symbols, and combine mathematical symbols correctly.
- Restrict syntax errors when solving mathematical problems.
- Understand the mathematical contents through the effective use of the language of mathematics contributing to the development of abstract thinking.

b) Contents and procedures to implement the measure

Step 1: Forming mathematical symbols

Step 2: Connecting the mathematical symbols

Step 3: Practicing using the syntax of the language of mathematics

c) Notes on measure implementation

d) Example

For example: *Organise for students to acquire and use symbols “<” when teaching the lesson on “Smaller. Mark <”(Math 1, p. 17).*

Step 1: Establishing the written form of mark <.

- Teachers have students observe mark <, then ask students to find mark < in Math kit.
- Teachers introduce how mark < is written with a careful and detailed instructions.

- Teachers organise for students to practice writing mark <.

Step 2: Connecting the mathematical symbols

- Teachers (Ts) introduces precise syntactical way of writing of the language of mathematics: Mark < is always between two numbers.
- Ts introduce how to connect the mathematical symbols for meaningful mathematical notice: (smaller number) (mark <) (bigger number). For example, one is smaller than 2, write $1 < 2$.

Step 3: Practising using the syntax of the language of mathematics

- Teachers organise for students to use math kit. Teachers make a statements and students selecte, and arrange so as to ensure

correct mathematical syntax and contents. For example, teachers say, “one is smaller than two”, then students must arrange rightly ($1 < 2$). Then, teachers have students discuss in pairs, one student states verbally and the other student writes those symbols, and then they exchange their tasks/ roles.

2.3.2. Group 2 of measures: Training for students to use the language of mathematics

Measure 1: Training for students to use the language of mathematics in teaching concepts

a) The purpose of the measure

b) Contents and procedures to implement the measure

Step 1: Using the language of mathematics to perceive mathematical concepts

Step 2: Using the language of mathematics to practice using the concepts

Step 3: Organizing for students to associate the concepts

c) Notes on measure implementation

d) Example

For example: *Training for students to use the language of mathematics when teaching the lesson on “Multiplication” (Math 2, p. 92).*

Step 1: Organizing for students to use the language of mathematics to perceive the concept of multiplication

Teachers organize for students to use the language of mathematics through the following activities:

- Teacher have students to observe visual aids or images and raise questions.

+ How many round dots are there in each cardboard? (2 dots)

+ How many cardboards are there? (5 cardboards)

+ 5 cardboards, each cardboard has 2 round dots, so, how many round dots are there in total? (10 dots)

+ How to get the results of 10 round dots? (Take $2 + 2 + 2 + 2 + 2 = 10$).

+ How many terms are there in the sum of $2 + 2 + 2 + 2 + 2$? (5 terms)

+ Commenting on the terms in the above sum? (All terms are equal)

The above sum has 5 terms, each term has the value of 2 equally. Teachers demonstrate how to move from the sum of equal terms to multiplication $2 \times 5 = 10$.

Teacher helps students realize number 2 is taken 5 times, then we have multiplication $2 \times 5 = 10$.

Mark \times called multiplication sign.

Teachers establish multiplication sign for students, and its correct syntactic written form in the the language of mathematics.

Step 2: Using the language of mathematics to practice using the concept of multiplication

Teachers organise for students to work in pairs to give the sums, then to establish the multiplication. For example, one student says and writes $4 + 4 + 4 = 12$, the other student says and write $4 \times 3 = 12$, then exchange the tasks to each other.

Teachers organise for students to give practical situations in life which can establish the multiplication. For example, a chicken has 2 legs, 2 chicken have 4 legs, then from this, they establish multiplication $2 \times 2 = 4$.

Teachers organise for students to complete exercises in the textbook.

Step 3: Organising for students to associate the concepts

In this lesson, multiplication is formed or established by summing the number of equal terms. Thus, students see the relationship between the sum and multiplication.

Measure 2: The training for students to use the language of mathematics in teaching rules and methods

a) The purpose of the measure

b) Contents and the procedures to implement the measure

Step 1: Using the language of mathematics to perceive rules and methods

Step 2: Using the language of mathematics to practice rules and methods

Step 3: Consolidating rules and methods through using the language of mathematics

c) Notes on measure implementation

d) Example

Measure 3: Training for students to use the language of mathematics in teaching how to solve mathematical problems

a) The purpose of the measure

Measure is aimed at:

- Training for students to use the language of mathematics effectively in teaching how to solve mathematical problems; contributing to development of language in general, and the development of the language of mathematics in particular.

- Helping students to move from natural language, images, visual drawings into mathematical symbols; Helping students know how to associate exactly the mathematical symbols in solving mathematical problems.

- Restricting the linguistic errors in general, and the language of mathematics in particular in teaching how to solve mathematical problems with the texts.

b) Contents and the procedures to implement the measure

Step 1: Making inquiries about the mathematical problem

Teachers have students to read the requirements of the exercise carefully and implement the following procedures:

- Determining the words having mathematical meaning of mathematical problem

- Determining words and phrases carrying information of the mathematical problem

Step 2: Summarising the mathematical problem

The results made in step 1 is the basis for students to perform well in step 2. Students look at the underlined words in the mathematical problem and summarize the mathematical problems using language, symbols, diagrams,... briefly.

Step 3: Establishing the methods to solve and present the mathematical problem

Step 4: Making comments and testing results

c) Notes on measure implementation

d) Example

Example: *Training for student to use the language of mathematics when doing the exercise “The first barrel contains 18 litres of oil, the second barrel contains 6 litres more compared with the first barrel. So, how many litres of oil are there in the two barrels?” (Math 3, p. 50).*

Step 1: Making inquiries about the mathematical problem

- Determining the words having mathematical meaning
- Determining words, phrases carrying information of the problem

After two above procedures, underline the words and phrases in the mathematical problem as follows: The first barrel contains 18 litres of oil, the second barrel contains 6 litres more compared with the first barrel. So, how many litres of oil are there in the two barrels?

Step 2: Summarising the mathematical problem

Students can look at the underlined words and phrases to summarize the mathematical problem in a straight line diagrams or verbal presentation.

Step 3: Establishing the methods of solving and presenting the mathematical problem

Step 4: Making comments and testing results

Teachers ask students to check the obtained results.

To contribute to development of language and thinking for students, for pretty good students teachers may suggest students make a new mathematical requirements on the basis of data of the mathematical problem. Then, students can make the following mathematical requirements:

The second barrel contains 24 litres of oil, the first barrel contains 6 litres less than the second one. So, how many liters of oil do the two barrels contain?

The first barrel contains 18 litres of oil, the second barrel contains 24 litres of oil. So, how many liters of oil do the two barrels contain?

The first barrel contain 18 litres of oil, the second barrel contains 24 litres of oil. So, how many litres of oil does the second barrel contain more compared to the first one?

2.3.3. Group 3 of measures: Developing communication skills using the language of mathematics

Measure 1: Developing listening - speaking skills in learning Mathematics for students

a) The purpose of the measure

The measure is aimed at helping students:

- Be able to listen, to receive and process information to understand the listened issues; Be able to express their opinions, ideas using sound and voice;

- Use precisely the language of mathematics in expressing ideas or presenting issues to make the listeners understand; boldly express their thoughts or ideas in front of the work group or the whole class.

- Have an opportunity to share and explore your ideas, overcoming limitations of the ability to “talk math”.

b) Contents and the procedures to implement the measure

Step 1: Training students to listen and understand the listened issue

Step 2: Presenting the issue just listened

Step 3: Making your own comments on your ideas and presenting your solutions to the issue

Step 4: Commenting and evaluating ideas

c) Notes on measure implementation

d) Example

Measure 2: Developing reading - writing skills for students in learning Mathematics

a) The purpose of the measure

b) Contents and the procedures to implement the measure

Step 1: Reading and understanding mathematical contents

Step 2: Rewrite the mathematical contents just read

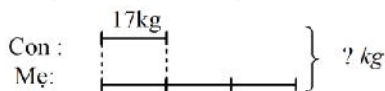
Step 3: Outlining the steps to solve problems and to present solutions

Step 4: Making comments and evaluating the solutions

c) Notes on measure implementation

d) Example

For example: *Developing reading - writing skills for students when doing the exercise “State the mathematical problem then present the solution according to the following summary:” (Math 3, p. 156).*



Step 1: Reading and understanding mathematical contents

- Teachers have students observe the diagram, and read silently mathematical contents that diagrams convey. When observing, the image of diagram is transferred into the students' mind and the students must understand the weight of the son or daughter is represented by one straight line, the weight of the mom is represented by three straight lines the same as of the son or daughter, so the weight of the mom is 3 times heavier than the weight of the son or daughter. Since then students read the entire contents of the mathematical problem.

- Teachers ask students to state the requirements of the mathematical problem.

Step 2: Rewrite the mathematical contents just read

Teacher have students rewrite the whole mathematical contents in accordance with the structure of a mathematical problem in text.

Step 3: Outlining the steps to solve problems and to present solutions

Teachers have students to work in small groups (3-4 students) to find out how to solve the mathematical problem. Then, teachers have students work individually to present the solutions.

Step 4: Making comments and evaluating the solutions

For pretty good students, they may find out other solutions to the mathematical problem. Looking at the diagram, students can find out equal parts ($1 + 3 = 4$ (parts)), then calculate the weight of both mom and son or daughter by performing multiplication ($17 \times 4 = 68$ (kg)).

CONCLUSION OF CHAPTER 2

In chapter 2, the dissertation has proposed levels of effective use of the language of mathematics and developed 3 groups of measures with the aim of providing a tool for teachers to help students of the first grades in primary schools to use the language of mathematics effectively.

However, another issue emerges and it need to be addressed: Are the measures proposed in chapter 2 feasible? Are they suitable to practical teaching in primary schools or not? To solve this problem it is necessary to conduct pedagogical experiments to examine the feasibility and effectiveness of the proposed measures.

Chapter 3 PEDAGOGICAL EXPERIMENTS

3.1. Purposes of experiments

Pedagogical experiments is aimed at testing the hypothesis of the dissertation through practical teaching. And, it is aimed to consider the feasibility and effectiveness of a number of proposed pedagogical measures.

3.2. Experimental schedules

Phase 1: From 30/1/2012 to 15/5/2012

Phase 2: From 01/21/2013 to 03/15/2013.

3.3. Experimental subjects

3.4. Experimental contents

The experimental contents aims to test the feasibility and effectiveness of the proposed measures, we did not choose teaching contents of specific knowledge, but carried out the contents according to the programs distributed by Ministry of Education and Training in the experimental tim.

3.5. Procedures to conduct the experiment

3.6. Methods for evaluating experimental results

3.7. Experimental results

3.7.1. Analysis of experimental results of phase 1

3.7.1.1. Analysis of experimental results quantitatively

*) Analysis of test results of semester of Grade 1A and Grade 1B

The test result of the second semester of Grade 1A and Grade 1B shown in Table 3.1.

Table 3.1. Test results of semester of Grade 1A and Grade 1B

x_i	Number of students	Mark 6	Mark 7	Mark 8	Mark 9	Mark 10	Average mark
$f_{i(TN)}$	36	0	5	7	10	14	8,92
$f_{i(BC)}$	35	3	6	8	9	9	8,43

To confirm the quality of pedagogical experimental phase, we processed the statistics. Results of processed statistics are shown in Table 3.2.

Table 3.2. Results of processed statistics of Grade 1A and Grade 1B

Marks	Grade 1A (Experimental group)		Grade 1B (Control group)	
	Frequency	Sum of marks	Frequency	Sum of marks
6	0	0	3	18
7	5	35	6	42
8	7	56	8	64
9	10	90	9	81
10	14	140	9	90
Total	36	321	35	295
Mean	$\bar{x} = 8,92$		$\bar{x} = 8,43$	
Variance	$S^2 = 1,13$		$S^2 = 1,61$	
Standard Deviation	$S = 1,06$		$S = 1,27$	

Using the test T - student to consider and test the effectiveness of pedagogical experiment results in $t \approx 2.9$

Looking up the distribution tables t- student with degrees of freedom $F = 36$ and the significance level $\alpha = 0.05$, we had result $t_\alpha = 1.68$. Then, we see that $2.9 > 1.68$ or $t > t_\alpha$. It can be seen that the pedagogical experiment has visible results.

*) *Analysis of results of semester exam of Grade 2A and Grade 2B*

*) *Analysis of results of semester exam of Grade 3A and Grade 3B*

3.7.1.2. Qualitative results

The qualitative analysis of the results showed that the use of the language of mathematics is more effective, and restricts the linguistic errors, and students have used precisely the language of mathematics in learning.

3.7.2.2. Quantitative Results

3.8. The general conclusion of the pedagogical experiment

It is said that the pedagogical experiment with the results obtained after the experiment showed the purposes of the experiment have achieved, the feasibility and effectiveness of the proposed measures was confirmed, and scientific hypothesis is accepted. The implementation of these measures in the process of teaching will help the first-grades students in primary schools use the language of mathematics effectively, and contribute to improving the quality of students' learning Mathematics.

CONCLUSION OF CHAPTER 3

The pedagogical experimental results showed that the level of effective use of the language of mathematics has positive change. Students had a firm foundation of the language of mathematics to better acquire mathematical knowledge. Students used the language of mathematics correctly and precisely in the expression (verbally and written) to solve mathematical problems. Many students gained progress, used the language of mathematics precisely in solving mathematical problems, and in exchanging or in presenting mathematical ideas. In the classes, students were excited and eager to participate in building lessons. Students like to exchange and communicate in math classes.

Thus, it can be confirmed that the proposed measures of the dissertation is feasible and can be implemented in teaching Mathematics in primary schools to help students use the language of mathematics effectively.

CONCLUSIONS AND RECOMMENDATIONS

1. Conclusion

The dissertation has been completed, and its scientific hypothesis is acceptable.

The dissertation has achieved the following results :

- The dissertation is an overview of research issues in the world and in Vietnam.

- The dissertation has contributed to systematising the basic theories on the language of mathematics including the concepts, functions, development history of the language of mathematics related to general mathematics and research aspects of the language of mathematics.

- The dissertation has analysed the language of mathematics in Mathematics textbooks of first grades in primary schools in the aspects of vocabulary, syntax, and semantics.

- The dissertation has investigated the actual use of the language of mathematics in mathematics teaching in primary schools *today*.

- The dissertation has proposed the levels of effective use of mathematics and developed three groups of measures, including 7 measures to help first grades students in primary schools use the language of mathematics effectively. The proposed groups of measures include: Organizing for students to develop their knowledge of the language of mathematics; Training for students to use the language of mathematics, and developing communication skills using the language of mathematics.

- The results of pedagogical experiments of the dissertation has initially confirmed the feasibility and effectiveness of the proposed measures.

- The dissertation can be a reference for teachers, administrators of primary schools , students of Primary Education of the School of Pedagogy, and Faculty of Education.

- The dissertation can be an information channel for professionals to build the curriculum in the next phase in defining objectives for developing communication skills using the language of mathematics, to integrate the mathematical terminologies and

symbols into the curriculum so that they are consistent with cognition and language development of students in primary schools.

2. Recommendations

- To help students use the language of mathematics effectively, firstly it is necessary to foster the theoretical awareness of the language of mathematics for teachers. Discussions and exchanges on investigating the contents of the language of mathematics in Mathematics textbooks in Primary education and the application in teaching should be organised. Moreover, seminars at school level or block level should be organized to exchange advantages, difficulties and measures in terms of language in general and the language of mathematics in particular in teaching Mathematics.

- Training curriculum of students majoring Primary Education should develop the special subjects about theory of the language of mathematics to help students understand and use precisely the language of mathematics in learning and teaching later. It is necessary to organise seminars on the language of mathematics in the curriculum, and Mathematics textbooks in Primary education so that students have more chances to expose to Mathematics in Primary education.

- In teaching, teachers need to create opportunities for students to practice and develop the language of mathematics because the language of mathematics has significant impacts on the quality of student learning.

- Primary curriculum which is going to be developed should integrate the goals “Developing communication skills using the language of mathematics” for students. In the process of developing the curriculum, it is necessary to pay attention to the language of mathematics suitably to the cognition, thinking and the development of language of students in primary schools.

- It is necessary to carry out more research topics and dissertation related to the effective use of the language of mathematics for students not only in primary schools, but also in secondary school, and high school.