

Research on the Cultivation Strategy of Primary School Students' Mathematical Language Expression Ability

Liang Guo

Yangtze University, Jingzhou, Hubei, 434000, China

Abstract: Learning mathematics is a process of learning mathematical language, which is the external manifestation of mathematical thinking, the carrier of mathematical knowledge and mathematical ideas and methods, and at the same time, mathematical knowledge also needs mathematical language as a medium to disseminate and communicate. In the study of mathematics, whether students can learn mathematics well is related to whether students have good mathematical language skills, but many studies can show that there are obvious deficiencies in the current mathematical language expression skills of primary school students. Therefore, teachers need to strengthen students' thinking training and good study habits, so as to further cultivate students' mathematical language expression ability and improve students' core literacy. To this end, this paper will elaborate on the concept and classification of mathematical language, as well as the cultivation strategies of primary school students' mathematical language expression ability.

Keywords: Primary School; Mathematical Language; Ability to Express Oneself.

1. Introduction

In 2022, the Ministry of Education promulgated the "Compulsory Education Mathematics Curriculum Standards (2022 Edition)", which proposes three core literacies. Among them, "being able to express the real world in the language of mathematics" refers to establishing a correspondence between the real world and the mathematical world, so as to better explain the real world and communicate with mathematics in abstract and concise mathematical language. At present, for most students, the mathematics they learn is like "dumb mathematics", they do not use the mathematical knowledge they have learned to express their ideas or solve practical problems, mainly because they do not internalize the language of mathematics into their own language system. The essence of this is due to difficulties in mathematical language, or the inability to use mathematical language correctly and reasonably. Therefore, in mathematics teaching, we should not only pay attention to the problem solving methods, but pay more attention to students' understanding and mastery of mathematical language, and strengthen the cultivation of students' mathematical language expression ability.

2. Overview of the Language of Mathematics in Primary Schools

2.1. Related Concepts

2.1.1. Mathematical Language

Mathematical language is composed of basic elements such as basic concepts, operation rules, formal logic, symbolic expression, and model construction, and is a tool for mathematical expression and communication. It uses symbols, terms, formulas, graphs, etc., to express mathematical concepts and relationships, with a high degree of abstraction, accuracy, logic, and conciseness.

Mathematics as a language is the clearest and most concise way to express the abstractness, logic and reality of mathematics, and like the language used in daily life, people can use such language to think, express and communicate, and can also use such language to recognize, understand and

reflect the real world.

2.1.2. Mathematical Language Expression

"Expression" refers to an act that reflects the results of thinking in words, expressions, behaviors, etc. At present, many scholars have classified mathematical language expressions, and most scholars tend to divide them into two categories: one is oral language expression, which refers to the act of conveying mathematical ideas, emotions and information through oral means, which has the characteristics of real-time, directness, flexibility, diversity and imagery. The other is written language expression, which refers to the act of transmitting mathematical information and expressing opinions through written forms such as words, symbols, images, etc., which has the characteristics of formality, normativeness, and planning.

2.1.3. Mathematical Language Skills

Mathematical language skills refer to students' ability to use mathematical language and explain mathematical concepts, theorems, proofs, problems and solutions accurately, concisely and logically. It includes mathematical verbal language expression and mathematical written language expression ability.

Mathematical oral language expression ability is the ability of students to verbally express their thoughts and communicate with others. Oral language is convenient and direct, and in the teaching process, teacher-student interaction is mainly carried out through oral expression. Teachers need oral language to impart mathematical knowledge, express mathematical ideas, and understand students' learning status.

Mathematical written language expression ability refers to the ability to express one's own problem-solving process and ideas in the form of written language. It is manifested in the neatness and accuracy of students' homework and tests, and reflects the logic of students' thinking.

2.2. Classification of Mathematical Languages

Due to the different definitions of mathematical language by scholars at home and abroad, the classification of mathematical language is also different. From the perspective of mathematical content, mathematical languages are divided

into: algebra language, function language, trigonometry language, geometric language, etc. From the composition of mathematical language, mathematical language is further divided into: mathematical concept vocabulary, mathematical propositions, mathematical arguments and mathematical problems. Starting from the expression of mathematical language, it can be divided into: oral language, written language and internal language. Many scholars at home and abroad tend to divide the language of mathematics into: written language, symbolic language, and image language. From this perspective, this article will also divide the language of mathematics into these three types.

2.2.1. Written Language

Written language is a mathematized natural language, but it has undergone a certain amount of processing, transformation, limitation and precision. It often appears in the form of mathematical concepts and terms, such as "straight line", "line segment", "line segment connecting the center of the circle and any point on the circle is called radius", etc., all of which are the result of the precision or definition of natural language. Written language sometimes reflects the semantic aspects of symbolic language and image language, and plays an explanatory role, for example, the concept of a line chart can be explained in written language. Written language has the characteristics of accurate expression, strong logic, and easy to understand. It is able to clearly explain mathematical concepts and definitions through natural language, so that students can accurately grasp the essence of mathematical content. Although the language of mathematics itself is relatively abstract and rigorous, in order to make it easier for others to understand, we need to bring the language to life.

2.2.2. Symbolic Language

Symbolic language is developed on the basis of written language, which is a symbol system used in mathematics to represent mathematical objects, mathematical relationships and mathematical laws, and is commonly used in the world. The mathematical symbol language is the biggest difference between the mathematical language and other languages, and it can generally include the following symbols: number symbols (1, 2, 3.....), letter symbols (a, b, x, y.....), operator symbols (+, -, ×, ÷), relationship symbols (=, ≠, ≈, >, <), logical symbols (∪, ∩, ∈.....). Symbolic language has the characteristics of conciseness, abstraction and universality, so in the process of using mathematical language for communication, reasoning and problem solving, teachers will generally guide students to use the least number of symbols to express the most complex quantitative relationships as much as possible.

2.2.3. Image Language

Image language is a chart or graph used in mathematics to visually represent mathematical objects, mathematical relationships, and mathematical laws, and it contains geometric figures, statistical analysis diagrams, function images, etc. Image language is intuitive, visual, and easy to remember. They provide a visual representation of the shape, size, position, and other properties of mathematical objects. Compared with the accuracy of text language and the abstractness of symbolic language, image language is more intuitive and vivid, which can better develop students' spatial thinking ability and imagination ability.

Written language, symbolic language, and image language are interdependent in mathematics teaching, and each of them

has unique advantages, but it is difficult to express the mathematical content comprehensively and accurately using any language alone. Written language can clearly define the meaning, connotation and extension of mathematical objects described by symbolic language and graphic language, which is popular and easy to understand, but the description is linear and it is not easy to reveal the internal structure of knowledge. Symbolic language abandons the redundant and protracted narrative of written language, makes thinking clear and accurate, reasoning rigorous, and concise expression, and at the same time makes up for and transcends the limitations of image language, and the description gives people a sense of structure, but it is relatively abstract. The image language provides an intuitive model for the written language and the symbolic language, and provides a basis for expanding the understanding of the written language and the symbolic language, but it also needs to be supplemented by a certain written language and symbolic language.

In conclusion, the same mathematical object can be represented in different types of mathematical language. Although these three methods may seem different on the surface, and the forms of linguistic expression are also very different, the mathematical essence contained in them is the same. It is precisely because of this diversity and identity of mathematical language that mathematics learning has the advantage of cultivating students' thinking flexibility and expansiveness.

3. Strategies for Cultivating Mathematical Language Expression Ability in Primary Schools

3.1. Create a Harmonious Atmosphere and Promote Mathematical Expression

Primary school students have poor self-control and are highly susceptible to environmental influences, so it is necessary to build a harmonious atmosphere for students to promote their mathematical language expression. First of all, teachers need to fully encourage students to dare to express themselves and help students overcome the psychology of being criticized for answering incorrectly. Secondly, on the basis of students' courage to express, certain requirements are put forward for students, who can use standardized and accurate mathematical language, etc., and give timely encouragement and help, so that students can fully express mathematics. Let the mathematics classroom become a democratic, harmonious and active expression base, and promote students' mathematical expression.

3.2. Pay Attention to Language Norms and Construct Expression Paradigms

Mathematical language has conciseness, rigor, abstraction, and logic, which is different from everyday spoken language that can be expressed at will, and it has certain norms. First of all, the teacher's demonstration must be accurate and standardized, so as to play a subtle positive guiding role for students. For example, many teachers tend to mix "multiplication" and "multiplication" when expressing multiplication and division, and "division" and "division" are mixed, which will have a negative impact on students. Secondly, teachers can consciously carry out mathematical language teaching activities, which should be included in every class, teachers can build the expression paradigm of

mathematical language, and students will internalize mathematical language into their own language system in the process of continuous imitation and practice, so as to strengthen students' mathematical language expression ability.

3.3. Timely Feedback in Class and Clear Expression of Cognition

In the classroom, teachers must give timely feedback on students' mathematical language expressions, so that students can know whether they have made mistakes in their expressions at the first time, give positive reinforcement to correct expressions, and correct errors in time. In most current mathematics classrooms, students' mathematical language expression is relatively casual, and teachers also think that as long as the students' central meaning is correct, they do not do too much investigation. In fact, this is a reflection of the lack of rigor in the language of mathematics, and timely feedback from teachers is crucial. For example, after the fifth grade students have learned the volume of the cube, the teacher examines the students' questions, and some students answer: "The formula for the volume of the cube is the length of the side by the length of the side." At this point, the teacher should give timely feedback: "In a square, we can say that the area formula is the length of the edges by the length of the edges, but in the cube, it should be the length of the edges by the length of the edges." At this time, the teacher needs to give timely feedback, and make key reminders, and clearly express teaching, so as to avoid other students having similar problems, so that students can express squares and cubes more accurately, understand their meanings more deeply, develop students' mathematical thinking, and improve students' mathematical language expression skills.

3.4. Strengthen Mathematical Reading and Enrich the Language System

For many teachers and parents, reading enhancement is closely related to the Chinese language, and to a certain extent, it can affect students' language performance, so most people ignore the importance of mathematics reading. Effective mathematics reading can not only improve students' comprehension, reasoning, abstract generalization ability, develop students' ability to think independently and explore independently, but also help to enrich and standardize

students' mathematical language and cultivate students' ability to communicate in mathematics. And in the current math classroom, few students and teachers do this. Therefore, in the classroom, teachers should consciously and purposefully guide students to read mathematics textbooks, cultivate students' good mathematical reading habits, improve reading ability, enrich the mathematical language system, and improve mathematical language expression ability.

Stoliar, a mathematics educator, once said, "The teaching of mathematics is also the teaching of the language of mathematics." At the primary school level, the development of students' mathematical language skills is crucial. To this end, primary school teachers should put the cultivation of students' mathematical language expression ability in an important position, create a harmonious and democratic learning atmosphere for students, and be able to do a good job of language expression demonstration for students, give timely feedback to students in the process of classroom teaching and communication, and strengthen mathematics reading with students, and promote students to improve their core literacy and mathematical accomplishment.

References

- [1] Kong Fanzhe; SHI Ningzhong. Interpretation of teaching activity standards of Compulsory Education Mathematics Curriculum Standards (2022 Edition)[J]. Journal of Tianjin Normal University(Basic Education Edition),2022, 23(06): 21-25.
- [2] Shi Ningzhong. Journal of Teacher Education,2022(03):92-96.
- [3] Chen Yongming, ed. Language Problems in Mathematics Teaching[M]. Shanghai: Shanghai Science and Technology Education Press, 1998.09.
- [4] Vygotsky, translated by Li Wei. Beijing: Peking University Press,2010:166-180.
- [5] Feng Zhiwei. Changsha: Hunan Education Press,1989.
- [6] Peng Yuhui. Journal of Southeast University (Philosophy and Social Science), 2020,22(S2):153-154.
- [7] Li Bangkui. Teaching and Management,2020, (14):54-55.
- [8] Wu Xianhua. Practical research on cultivating mathematical language expression ability of upperprimary school students [D]. Hangzhou Normal University,2019.