Reflections on the Implementation of Data Concept Literacy in Junior High School Mathematics ClassroomTeaching

ABSTRACT: As one of the core literacy proposed by the *Mathematics Curriculum Standards for Compulsory Education (2022 Edition)*, the implementation of the data concept in the current junior high school mathematics classrooms has attracted much attention in China. This paper used the method of theoretical research and based on clarifying the connotation and characteristics of data concept literacy, combined with the highlights and shortcomings of the current teaching, put forward four suggestions: 1. Design implementable statistical activities; 2. Focus on summarizing the similarities and differences and characteristics of data analysis methods; 3. Use of multimedia emerging technologies to assist teaching effectively; 4. Design the topic of probability to carry out special training, hoping to provide ideas for better development of junior high school mathematics teaching.

Keywords: Core literacy of mathematics Subject; Data concept; Junior high school

1. INTRODUCTION

*TheCurriculum Standards for Compulsory Education (2022 Edition)*clearly points out that the concept of data, as one of the important manifestations of the core literacy in the compulsory stage, is conducive to students' understanding and perception of the occurrence of random phenomena in reality. The importance of data analysis in the context of the era of big data is conducive to the development of students' ability to solve practical problemsand is the basis for the formation of high school data analysis literacy. So what is the connotation and characteristics of the core literacy of data concept? What is the current situation of junior high school mathematics teaching? To cultivate students ' data concept literacy, what measures should be taken in practical teaching? This paper will analyze the above problems.

2. ANALYSIS OF DATA CONCEPT LITERACY

The Curriculum Standards for Compulsory Education (2022 Edition)(hereinafter referred to as the *Curriculum Standards*) points out that the concept of data is a clear understanding of the meaning and randomness of data. The concept of data is an important manifestation of the core literacy of the compulsory education stage. For the core literacy of the data concept, the*Curriculum Standards*proposes the following training objectives [1] :

2.1 Able to know the data contains information

Data refers to the symbols that record and identify objective things. It is a combination of physical symbols and physical symbols that record the mutual state of

objective things [2]. The purpose of this requirement is to enable students to understand that the actual information is contained in the data and to understand the significance of the data. Students should know that the data is a basic language of statistics and that the data generally has its practical meaning, and it can be collected, collated, and analyzed. Data extraction can effectively analyze the information of practical problems.

2.2 Methods of collection, collation and analysis can be determined according to the background of the problem and the problem to be studied.

The information contained in the data is often not obvious. After the receipt is collected, it is usually necessary to use appropriate methods to sort out and analyze it, and to mine and express the information contained in the data. This request requires that students should be able to master a variety of data collection, collation, analysis methods, and be able to analyze specific problems. According to the different problems to be studied and their backgrounds, appropriate data processing methods should be adopted to solve problems in a targeted and efficient manner.

2.3 Able to know how to describe the trend of random phenomena and the likelihood of random events occurring quantitatively

The quantitative method refers to the use of numerical values to express the desired things; random phenomenon refers to the phenomenon that may or may not occur under certain conditions; the changing trend of random phenomenon refers to the overall movement trend or development direction of the random phenomenon in the future time. Random events may or may not occur in a single randomized trial, but they show a regular event in a large number of repeated trials [3]. The likelihood of random events occurring is measured by their probability.This goal hopes that students can use mathematical language to describe the overall movement trend or development direction of random phenomena at a specific time in the future based on a deep understanding of random phenomena and random events and use probability to explain the likelihood of random events.

3. CURRENT SITUATION OF TEACHING AND LEARNING

3.1 The lack of practice teaching of statistical activities

Due to the limitation of class time, the heavy teaching task, and the time-consuming experience of the whole process of statistics, many middle school teachers only use the teaching method when teaching statistical knowledge, and just impart the existing content in the textbook to students by words. There are fewer arrangements for real and operable statistical activities, fewer opportunities for students' hands-on practice, and a lack of exploratory activities. Interactive communication is also mostly " teacher-student interaction". Although there is inquiry learning in class, teachers only pay attention to the results of inquiry, and "group discussion"is too formal and inefficient [5].

3.2 Pay attention to the teaching of statistical methods but neglect the adaptability of the problem situation.

Under the background of process and method orientation, teachers gradually attach importance to explaining the process of knowledge method exploration. However,

inthe class of statistics, teachers often only pay attention to the teaching of the principle and operation steps of data statistics methods but ignore how to apply these methods to the teaching of solving practical life problems, it also rarely involves how to choose appropriate methods in specific situations [4]. It is difficult for students to make accurate choices when facing the background of practical problems, and it is difficult to improve their practical application ability.

3.3 Improper use of mathematics teaching software

Mathematics teaching software has the advantages of being intuitive and efficient, and it is widely used in contemporary junior high school mathematics Statistics classes, but there are some improper uses. Many teachers rely too much on multimedia teaching, present all the teaching process on PPT, and lack the necessary blackboard writing. In the Statistics and Probability class, teachers also did not fully utilize the effectiveness of mathematics teaching software, but only as a display of knowledge points, there is no large number of repeated test simulations,drawings of statistical charts and other more dynamic and effective uses.

3.4 Some teachers give priority to teaching, ignoring the practice of students.

In the current mathematics class, due to the limitation of class hours, teaching content and class size, the mathematics class is still dominated by teaching, and the students have less practice. Students' exercises are mostly in the form of homework after class. There is not much time for real guided exercises, and the practice effect is difficult to guarantee. The teachers' explanation of the problem in the classroom is also mostly one-way teaching. The students only listen by ear, the sensibility is not strong, the computing ability is weak, and it is difficult to really master the thinking method and form the knowledge system.

4. IMPLEMENT DATA CONCEPT LITERACY RECOMMENDATIONS IN THE CLASSROOM

To implement the core literacy of data concept in the actual class and improve the teaching effect, this paper puts forward the following suggestions to junior high school teachers :

4.1 Design implementable statistical activities

This strategy suggests that teachers should design clear statistical activities based on the teaching objectives and teaching content, based on grasping the class time and starting from the actual life of students. Let students experience the statistical process of sampling and collecting data, drawing statistical charts, analyzing and sorting out data, and inferring predictions.

One of the requirements for students in the *Curriculum Standards* is that students should know that the data contains information, which requires students to know that the data contains practical significance, that the data is the carrier of information, and that the actual information in the data needs to be extracted through certain statistical steps. One of the current teaching situations is the lack of practical teaching of statistical activities in class. Students lack personal experience in the process of completing statistical activities, and their sensitivity is not strong, so it is difficult to understand the information contained in the data.Therefore, the current teaching

should design a complete and implementable statistical activity. Statistical activity is an important way for students to understand the practical significance of data and improve their data concept literacy. Students experience statistical processes such as simple sampling, data collection, data collation, and data analysis, use statistical methods to solve practical problems, and can understand the actual information contained in the data. Students' personal experience of complete statistical activities can enrich their direct experience and understand the information contained in the data. The hands-on operation can deepen students'understanding of the data and effectively improve the core literacy of the data concept.

4.2 Focus on summarizing the similarities, differences and characteristics of data analysis methods.

This strategy suggests that teachers should introduce the principle, derivation and method steps of each data processing method, and also pay attention to the summary of each data analysis and collation method, introduce the similarities, differences and characteristics of each methodso that students can consolidate and understand the advantages and disadvantages of specific methods and operation steps in specific exercises until they understand and master them.

The *Curriculum Standards* requires students to be able to determine the methods of collection, collation, and analysis based on the background of the problem and the problem to be studied. This requires students to be able to fully grasp the various data collection, collation, and analysis methods, and fully consider the characteristics of various methods. Select the appropriate method of data collection, processing and analysis according to the characteristics of the problem situation. One of the current teaching situations is that the adaptability between various methods and problem scenarios is not high, and it is difficult for students to accurately select appropriate methods according to the problem situation.Therefore, this strategy requires teachers to pay attention to the comparison of the similarities and differences of data processing and analysis methods in the classroom. Knowing the similarities and differences between methods is conducive to students' horizontal comparison and analysis of the characteristics, advantages and disadvantages of various methods. It is helpful for students to choose suitable data analysis methods according to the characteristics of the data and the problem situations to be solved. This strategy can not only enable students to experience the rigor of mathematics, and improve logical thinking ability, but also cultivate students' concept of data analysis.

4.3 Use of Multimedia Emerging Technologies to assist teaching effectively

This strategy suggests that teachers should flexibly use Excel, SPSS, Python, Matlab,and other mathematical softwareto assist the teaching of statistical knowledge in classroom teaching according to the teaching objectives and teaching contents, and use the above software to summarize, sort and screen the data, and draw statistical charts such as histograms and scatter plots.

One of the requirements of the *Curriculum Standards* for the core literacy of students' data concepts is that students can use quantitative methods to describe the trend of

random phenomena and the possibility of random events. This requires students to be able to understand the randomness of random phenomena and random events in random experiments, and to experience the significance of probability in a large number of repeated experiments. Modern emerging technologies can simulate a large number of repeated random experiments and use software to show the changing trend of random phenomena by analyzing data. Students can feel the randomness of random linearity and intuitively understand the significance of random event probability, making up for the shortcomings of blackboard teaching. One of the current teaching situations is that modern information technologies widely exist in junior high school mathematics class, but it is improperly used and too formalized. It is only used as a display of knowledge points and cannot give full play to its effectiveness.Therefore, this strategy requires teachers to make rational and effective use of modern information technology such as Excel and SPSS to assist teaching, use dynamic displays to help students understand random events and random phenomena, enrich students' perceptual experience, and comprehensively improve students' core literacy of data concepts.

4.4 Design probability topics for thematic training

This strategy requires teachers to set up probability topics in the statistics class based on teaching objectives and teaching content, lead students to carry out probability calculation exercises, describe the possibility of random events according to the calculation results of probability, learn the calculation of probability, and understand the significance of probability.

In the *Curriculum Standards*, students are required to use quantitative methods to describe the trend of random phenomena and the possibility of random events. The possibility of random events is the probability of the event. This requires students to predict the trend of random events and describe the possibility of random events by calculating the probability of random events. One of the current teaching situations is that many math teachers focus on the teaching of knowledge points in their class, so that students have fewer opportunities to practice andtheir sensitivity is not strong, and their thinking methods are relatively simple. Therefore, this suggestion requires teachers to carry out special training on probability topics in the classroom, so that students can calculate the possibility of random events in a quantitative way, describe the size of the possibility of random events through the results, predict the changing trend of random phenomena, understand the significance of probability and develop the core literacy of data concept.

5. CONCLUSION

In the *Curriculum Standards* junior high school mathematics classes are required to pay attention to the improvement of students' "core literacy". Therefore, measures must be taken to implement the cultivation of core literacy in junior high school mathematics classroom teaching. Based on fully understanding the connotation and characteristics of data concept literacy, combined with the current situation of mathematics teaching, this paper believes that teachers should design implementable

statistical activities in the classroom, pay attention to summarizing the similarities and differences and characteristics of data analysis methods, effectively use multimedia emerging technologies to assist teaching, design probability topics for thematic training, etc., guide students to form a rational thinking method of "speaking with data" and constantly develop students' data concept.

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