Research on the Content Evaluation of Mathematical Model Course under the Background of New Curriculum Reform

Wang Yu[*], Liu Xudong

Neusoft Institute Guangdong, Foshan, 528225, Guangdong, China

*Corresponding Author

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Abstract: At Present, China's Evaluation System is Gradually Developing and Perfecting, and the Development Focus Has Gradually Shifted to the Evaluation of Teaching Models in the Field of Education, Especially for Students' Academic Evaluation. Moreover, the Chinese Education System Has Been Gradually Deepened, the New Curriculum Reform Has Been Implemented, and the Evaluation of Students' Learning Efficiency and Learning Outcomes Has Been Further Improved. in This Process, Mathematical Models Have Very Significant Application Advantages. Based on This, This Paper Explores the Process of Mathematical Model Construction under the Background of New Curriculum Reform. Moreover, the Application of Mathematical Models in the Evaluation of Course Content under the Background of New Curriculum Reform is Further Studied.

1. Introduction

1.1 Literature Review

Lu Xurong started the teaching status quo of middle school mathematics and discussed the innovation of junior high school mathematics under the new curriculum reform mode. He also believes that changing the traditional teaching concept and implementing the student's main body of teaching can achieve the teaching purpose of improving students' comprehensive quality (Lu, 2016). Under the background of the new curriculum reform, Wang Peiqiang studied the construction of the teaching mode of junior high school mathematics. In addition, a series of countermeasures such as "introducing-exploring-using-reviewing" are proposed in combination with real life to highlight value, active inquiry to enlighten thinking, and fun guidance (Wang, 2016). Xu Xiaohong believes that the establishment and solution of the model can help students solve practical problems by using mathematical tools from the practical perspectives of life and production. The study of mathematical problems such as functions, inequalities, and equations can help students form a preliminary model thinking, thereby enhancing students' interest in learning mathematics (Xu, 2017). Based on the background of the new curriculum reform, Tan Yuansen conducted an in-depth study of the evaluation of high school mathematics assignments. In addition, aiming at the shortcomings and current situation of current high school mathematics assignment design, and aiming at the teaching goal of high school mathematics, a diversified assignment design (Tan, 2018) is proposed. Sun Wei pointed out that primary school mathematics education does not integrate life elements into practical teaching, which is not conducive to the better use of what students learn in real life. Based on this, Sun Hao's mathematics education in primary school has been studied and is of great significance to practical teaching (Sun, 2019).

1.2 Research Purposes

Under the background of the new curriculum reform, the traditional Chinese teaching evaluation model can no longer meet the current learning situation of modern teaching. If we do not change and improve the traditional evaluation methods, it will have a greater adverse impact on the implementation effect and implementation quality of the new curriculum reform. For the evaluation of students' learning, the requirements of the new curriculum reform mainly include four aspects, namely, pluralism, comprehensiveness, procedurality and development. Based on this, this paper

deeply discusses the evaluation and application of the mathematics model course content under the background of the new curriculum reform, in order to provide a useful reference for the evaluation of the mathematical model course content under the new curriculum reform background.

2. Overview of Relevant Theory

In the real world of human life, from the mountains to the rivers, from the sun to the elementary particles, to the insects, birds and beasts, are objective things. The motion patterns of these things are collectively referred to as entities. Chinese scientist Hua Luogeng suggested that the main task of scientists is to describe the characteristics of the entity through modeling, and finally use the continuous improvement and improvement to accurately describe the characteristics of the entity. Through modeling, people can better understand the nature and laws of things. The mathematical model is a model that simulates real entities through mathematical language (Gong, 2018). In other words, a mathematical model is a mathematical structure that uses mathematical language to abstract the main relationships and features of something and to describe it mathematically. In essence, a mathematical model is a model that approximates the quantitative relationship and spatial form of objective things.

People divide the natural phenomena into four types, namely, fuzzy phenomena, contingent phenomena, inevitable phenomena, and sudden phenomena. In the process of long-term practice, these four natural phenomena have been abstracted into four structural forms and quantitative relationships by scholars, and four representative mathematical theories have been formed in the process of continuous evolution. These four mathematical theories are catastrophe theory, stochastic mathematics, classical mathematics, and fuzzy mathematics. According to different mathematical theories, scholars have proposed four mathematical models. The first is a mathematical model that describes the inevitable phenomenon. This model is mainly to describe some inevitable phenomena in nature. Often, mathematical models of inevitable phenomena are primarily described by network diagrams and relationships, and are a very common and common model (Gao, 2017). The second is a mathematical model describing the phenomenon of mutation. This model is mainly to explain the way in which things in nature are qualitatively changed, as well as the essential causes of gradual changes and mutations. The third is a mathematical model that describes the likelihood phenomenon. This model is mainly used to describe the phenomenon of contingency in nature, and it can reflect the distribution of various outcomes possible in nature. Modeling methods mainly include the establishment of statistical methods, process theory and probability theory. The fourth is the mathematical model of the fuzzy phenomenon. The proposed model mainly deals with and describes various kinds of fuzzy information and fuzzy phenomena existing in nature.

3. The Process of Mathematical Model Construction under the Background of New Curriculum Reform

In essence, the construction of mathematical models is a process of thinking using mathematical thinking. At the same time, the process of mathematical modeling is also a process of describing key features of real phenomena through mental activities. In general, mathematical models are characterized by symbols. From the perspectives of management, economics, science and engineering, mathematical modeling is actually using mathematical methods and language to create an effective mathematical tool that can solve practical problems through simplification and abstraction. Moreover, from another point of view, when we look at real problems from different angles and different sides, different mathematical models will be produced. Therefore, the process of mathematical modeling has some artistic features to a certain extent. Most importantly, mathematical modeling is a process that requires practice testing and continuous modification and improvement.

There are different mathematical models for different types of real-world problems. However, the basic steps used in the mathematical modeling process are basically the same as the thinking process. Establish a complete mathematical model, the specific content and process mainly have the

following points. The first is the need to abstractly analyze the problems that need to be solved in the real world and construct mathematical models for them. The second is to calculate and reason the established mathematical model, and use mathematical methods to solve the model. The third is to bring the obtained solution into the real problem, in order to test the established mathematical model, or get the real solution of the real problem.

In addition to the above modeling content, the steps of mathematical modeling mainly have the following steps. The first step is to analyze the real problems that need to be solved. This step is mainly to analyze the relationship between the structure and the object of the real problem, in order to clarify the mathematical methods and types of models to be used. The second step is to clarify the relationship and basic quantities of the actual problems of the research. If necessary, you can make assumptions about it. The third step is to rationally simplify and mathematically abstract the actual system, and use mathematical symbols and mathematical language to express the relationship between various quantities, and then obtain a mathematical model that can solve practical problems. The fourth step is to calculate and derive the mathematical model of the construction, and then obtain the parameter estimation and mathematical results of the mathematical model. The fifth step is to test the mathematical model of the build. If the test results are unqualified, it indicates that the mathematical model constructed is unreasonable and unscientific, and further optimization and improvement are needed. If the test results are qualified, it means that the mathematical model constructed basically meets the requirements. The sixth step is the practical application of the mathematical model. In other words, in the solution of the actual problem, substitute the mathematical model constructed.

4. Application of Mathematical Model in Course Content Evaluation under the Background of New Curriculum Reform

In the context of the new curriculum reform, the evaluation of the course content needs to focus on the absolute evaluation of the content of the course. At the same time, it is also necessary to pay attention to the relative evaluation. Moreover, the evaluation results need to focus on the student's learning input and learning outcomes. The mathematical model mainly has two evaluation methods, namely Markov chain and data envelopment analysis. These two evaluation methods fully consider the background factors of students and are effective and commonly used methods for evaluating course content.

First of all, this paper studies the application of data envelopment analysis in course content evaluation. Data envelopment analysis is a non-parametric evaluation method with relative efficiency. The advantage is that it can effectively evaluate many decision-making units of the same type with multiple outputs and multiple inputs. Using data envelopment analysis method, comprehensive analysis of output data and input data of each decision-making unit can obtain quantitative indicators of the overall efficiency of decision-making units. Based on this indicator, it can be determined which decision units are valid. Moreover, non-effective decision-making units can also be evaluated to provide further relatively reliable data support for decision making. Therefore, the evaluation of students' learning, data envelopment analysis is a very reasonable and valuable method.

By adjusting the weight variables, the evaluation unit efficiency evaluation index can be maximized, which is also the optimization goal described by the DMU optimization model. In this optimization model, the constraint is that the efficiency evaluation index of the decision unit is equal to or less than 1. When DMU_0 is invalid, it indicates that the evaluated object has insufficient output or input redundancy. At this point, the output is insufficient (ΔY_0) The input redundancy (ΔX_0) is:

$$\Delta Y_0 = Y_0 - \hat{Y}_0 = S_0^+$$

$$\Delta X_0 = X_0 - \hat{X}_0 = \left(1 - \theta_0\right)X_0 + S_0^-$$

Evaluation by data envelopment analysis is an objective evaluation of students' comprehensive learning situation, and it is not only a simple evaluation of students' academic performance. Evaluation and effective diagnosis of non-effective students, and further countermeasures can effectively improve students' learning efficiency.

Secondly, this paper studies the evaluation of the course content of the Markov chain in the student group learning. This method was established on a random basis, and the original fundamental differences of the evaluation objects were processed. Therefore, this method is more suitable for the evaluation of group learning efficiency. First, it is necessary to classify the academic performance of the students in the class, and to calculate the academic performance of the students evaluated and the level in the class. Second, for the above content, a state transition matrix is established. Third, establish evaluation criteria. The evaluation advantage of the Markov chain is to pay attention to both the degree of student regression and the progress of the students' collective. To evaluate the efficiency of student learning, it is necessary to extract the amount of change from the transfer matrix as much as possible. In the process of establishing evaluation criteria, the difficulty gap between the two tests should be considered. The Markov chain evaluation model is simple and practical, and it is one of the effective means of course content evaluation. Therefore, this paper establishes the following model to evaluate the overall curriculum learning of students.

$$S_{ij} = \begin{cases} (i-j)^3 \alpha p_{ij} \\ \left[\left((i-j)^3 \right) + (i-j) \right] \beta p_{ij} \end{cases}$$

At this stage, with the implementation of the new curriculum reform policy, mathematical models have gradually become an effective means to evaluate students' learning efficiency. Mathematical models can incorporate qualitative research and highlight quantitative research. Therefore, the evaluation results of the mathematical model have higher credibility. Moreover, the mathematical model can be used not only in diagnostic research, but also in summative research, and is an effective way to evaluate course content.

References

[1] Lu X.R. (2016). Research on the Innovation of Junior Middle School Mathematics Teaching Model under the Background of New Curriculum Reform, New Curriculum Research (Later), 11 (2), 104-105.

[2] Wang P.Q. (2016). Research on the Teaching Mode of "Introduction-Exploration-Use-Review" in Junior Middle School under the Background of New Curriculum Reform, Inner Mongolia Education, 65 (18), 83-83.

[3] Xu X.H. (2017). Cultivating Junior Middle School Mathematical Modeling Thoughts, Guiding Students to Investigate and Study Independently--The Practice and Thinking of Rural Junior Middle School Mathematics Teaching under the Background of New Curriculum Reform, China Rural Education, 29 (10), 36-37.

[4] Tan Y.S. (2018). Research on the Evaluation of High School Mathematical Assignment under the Background of New Curriculum Reform, Secondary Education Reference, 10 (24), 13-15.

[5] Sun W. (2019). Research on the Life of Primary School Mathematics Teaching under the Background of New Curriculum Reform, Chinese Teenager, 31 (9), 134-134.

[6] Gong J. (2018). Analysis of the Life of Mathematics Teaching in Primary Schools, Chinese Journal of School Education, 2018, 12 (16), 118.

[7] Gao W.W. (2017). Research on the Evaluation of Primary Mathematics Classroom Teaching under the Background of New Curriculum Reform, New Campus (Reading), 11 (1), 53-53.