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Teaching and Improvement Strategies of the "Comprehensive and Practical" Module in Primary School Mathematics from the Perspective of the New Curriculum Standard

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Abstract: With the promulgation of the Compulsory Education Mathematics Curriculum Standard (2022 Edition), China's education sector attaches great importance to the field of comprehensiveness and practicality, which clearly puts forward comprehensive and practical implementation suggestions for the "Comprehensive and Practical" module, with novel and extensive content. However, practical investigations have found that most of the practical systems in this field focus on form rather than truly reflecting the value and significance of the module, leading to many problems and challenges in the teaching of the "Comprehensive and Practical" module in primary school mathematics. Based on the analysis and sorting of relevant texts on primary school mathematics "Comprehensive and Practical" courses, this study uses questionnaire surveys to investigate the teaching situation of the module in Z Primary School in Zhengzhou, identifies existing problems and their causes, and proposes targeted countermeasures and suggestions, aiming to improve the practical efficiency of primary school mathematics comprehensive and practical teaching.

Keywords: Curriculum standard; Primary school mathematics; Comprehensive and practical

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1. Introduction

The "Comprehensive and Practical" module is an important learning field of primary school mathematics clearly stipulated in the "Compulsory Education Mathematics Curriculum Standard (2022 Edition)" (hereinafter referred to as the "New Curriculum Standard"). Learning in this field involves multiple dimensions such as mathematical knowledge, thinking methods, skills, and emotional attitudes. It helps students solve practical problems based on existing knowledge and experience, improve mathematical literacy and comprehensive abilities, and promote the integration of knowledge within mathematics and across disciplines, which meets the demand for compound talents in the era of globalization and informatization. Therefore, how to effectively implement the teaching practice of this module in regular primary school mathematics teaching has become an important topic in current mathematics education research.

2. Research on the teaching of the "Comprehensive and Practical" module in primary school mathematics based on the new curriculum standard

2.1. Optimization of the "Comprehensive and Practical" module in the new curriculum standard

2.1.1. Comprehensive transformation of content structure

The preface of the New Curriculum Standard clearly proposes to set up interdisciplinary content learning practices, strengthen interdisciplinary connections, and promote comprehensive practice in the teaching of this module. This indicates that the New Curriculum Standard's requirements for content structure are more inclined to reflect interdisciplinary, comprehensive knowledge. That is, it not only focuses on the integration within mathematics but also emphasizes the integration and application of interdisciplinary knowledge. In contrast, the "Comprehensive and Practical" module first proposed in the 2011 Edition Curriculum Standard, focused on the connection between mathematics itself and real life [1].

2.1.2. Thematic design of practical activities

The New Curriculum Standard divides "Comprehensive and Practical" into two types of thematic activities: one is thematic activities integrated with mathematical knowledge learning; the other is thematic activities applying mathematical knowledge and knowledge from other disciplines. Thematic learning is more inclined to reflect interdisciplinary, comprehensive knowledge and experience. In the implementation suggestions, five to six thematic references are provided for each learning stage to realize interdisciplinary thematic comprehensive practice. The 2011 Edition Curriculum Standard emphasized that the key to the implementation of this field lies in comprehensiveness and practice, with activities as the carrier, highlighting students' active participation in the overall activities; it provided eight examples for reference in the curriculum implementation suggestions.

2.1.3. Unitized organization of class hour arrangement

In terms of content arrangement, the New Curriculum Standard has increased class hours, shifting from once a semester to micro-units. For example, "Happy Shopping Street" in the first learning stage can be designed to be completed in 4 class hours; "The Story of Cao Chong Weighing the Elephant" in the second learning stage can be designed in 5 class hours; "Nutritious Lunch" in the third learning stage can be designed in 6 class hours. These unitized contents reflect the comprehensiveness of mathematics and the integration of interdisciplinary knowledge, helping students understand this part of the content more clearly from the foundation. The 2011 Edition Curriculum Standard only proposed that at least one "Comprehensive and Practical" course should be arranged each semester.

2.2. Content structure of the "Comprehensive and Practical" module in primary school mathematics

2.2.1. First learning stage: Focus on daily life problems

The curriculum content of the first learning stage is selected from specific things in students' daily lives, focusing on observing surrounding things, paying attention to students' acquisition of activity experience and emotional attitude development, stimulating students' interest in mathematical knowledge existing in life, and facilitating the smooth development of comprehensive and practical activities. The implementation of thematic activities at this stage should be conducive to students' participation and experience. Guidance should be provided to all students, followed up throughout the process, and attention should be paid to students' participation.

2.2.2. Second learning stage: Cross-disciplinary practical problem solving

The curriculum content of the second learning stage develops from simply solving mathematical problems encountered in daily life to solving interdisciplinary problems, deepening the understanding of mathematical knowledge, and the connections between mathematics and other disciplines. Students experience the process of solving simple problems, improve their awareness of applying existing knowledge, perceive the value of mathematics, and are guided to deepen their participation in activities step by step [2].

2.2.3 Third learning stage: Abstract mathematical knowledge and project-based learning

The curriculum content of the third learning stage is more inclined to abstract mathematical knowledge, solving comprehensive practical problems through activities, and adding project-based learning. Students can independently determine themes based on projects, collect materials through on-site measurement, conduct research, solve problems, and complete activities. This well cultivates students' innovative awareness and creative abilities, forming model awareness and initial application awareness.

3. Problems existing in the teaching of the "Comprehensive and Practical" module in primary school mathematics

Through a questionnaire survey of 100 primary school mathematics teachers in Zhengzhou and interviews with 10 teachers, the following problems were found in the current teaching practice of the module.

3.1. Insufficient depth of teachers' cognition

Most teachers conduct actual teaching in the "Comprehensive and Practical" field relatively infrequently, at most four times a semester, and do not attach great importance to the teaching of this module, leading to serious problems such as absence and substitution in the teaching of the "Comprehensive and Practical" module. Some teachers do not pay attention to students' experiences and feelings in the module activities, ignoring the understanding of the essence of "comprehensiveness" and "practicality."

According to the requirements of the New Curriculum Standard, the teaching of the "Comprehensive and Practical" field has evolved into micro-units, and some themes require five to six class hours to complete. If the content of this field is not set or is not well combined with students' real lives, it will ignore the cultivation of students' practical processes, as well as their learning interest, comprehensive awareness, and practical abilities [3].

3.2. Insufficient innovation in themes and content

Some teachers over-rely on textbooks and teaching references when selecting themes for the "Comprehensive and Practical" module, fail to make necessary and reasonable expansions to textbooks, and lack innovative analysis in the selection of theme content. In teaching, they cannot design reasonably in accordance with the New Curriculum Standard's requirements for "Comprehensive and Practical" courses, nor can they effectively integrate this part of the content with the real lives of the students they teach.

Some teachers have limited abilities. They lack the awareness of diversified thinking in theme design, the accumulation of relevant knowledge and teaching experience, the practice of exploring innovation in practice, the bold and innovative thinking to break fixed models, and the awareness of expanding their thinking to be close to students' real lives. The selection of teaching themes and content has a significant impact on cultivating students' comprehensive awareness and practical skills, so the selection of teaching themes and content must be innovative and expanded on the basis of the foundation [4].

3.3. Single form of activity methods

Most courses in this field are directly designed by teachers, who provide project requirements and let students complete activities according to the requirements. They provide activity plans without students' personal experience, and the design and implementation of activity plans do not fully reflect students' subjectivity.

Such a learning model and a fixed-rhythm, single-method teaching classroom cannot well organize students to design and implement plans themselves, and cannot meet the new needs of contemporary intelligent classrooms. The key to comprehensive and practical teaching activities lies in comprehensive and practical teaching methods [5].

3.4. Imperfect teaching evaluation mechanism

Teachers mainly use verbal expressions to let students summarize comprehensive and practical activities, and a few use forms such as activity report forms to report and summarize. The development of language skills is very important for primary school students, but the combination of language skills and activity processes can help students better understand the relationship between knowledge and problem-solving.

Comprehensive and practical learning activities can fully reflect students' ability to solve problems in real scenarios and their comprehensive mathematical abilities. Therefore, the learning evaluation of "Comprehensive and Practical" should be diverse, which can include student self-evaluation, peer evaluation, teacher evaluation, and group evaluation.

3.5. Lack of teacher training support

Almost all teachers who participated in the questionnaire hope to receive training related to primary school mathematics "Comprehensive and Practical" courses, which indicates that teachers still have some problems in the teaching of "Comprehensive and Practical" that need to be addressed through training, and also reflects that schools arrange relatively few relevant training sessions.

Teacher training is a major topic in teachers' professional development. It can provide teachers with a good development platform; effectively improve teachers' professional literacy, promote the development of their professional knowledge and abilities; and help them better grasp the development direction of education, thereby conducting teaching better.

4. Countermeasures and suggestions for the effective implementation of the "Comprehensive and Practical" module in primary school mathematics

4.1. Strengthen school support and training mechanisms

The overall educational environment has a significant impact on front-line primary school mathematics teachers. If schools vigorously promote "Comprehensive and Practical" courses in the overall environment, front-line primary school mathematics teachers will also strive to learn in such an environment. Schools should adopt appropriate reward and punishment measures to support and encourage teachers who actively learn and carry out "Comprehensive and Practical" teaching, and select excellent teachers [6].

For current primary school mathematics teachers, especially those with long teaching experience, they are quite familiar with the implementation of traditional mathematics courses, but have not fully understood and mastered the new educational and teaching concepts and the provisions of the curriculum standard. In this actual teaching situation, schools need some external incentives and establish corresponding reward and punishment systems. Moreover, the survey and analysis show that teachers are very enthusiastic about learning training related to "Comprehensive and Practical" courses. At this time, schools need to pay more attention to arranging relevant training to improve teachers' teaching concepts in the "Comprehensive and Practical" module.

4.2. Deepen teachers' understanding of the curriculum standard and teaching design capabilities

Teachers need to attach importance to the teaching of this field and carefully study and analyze the requirements of the curriculum standard. They should explore the connotation of teaching activities in the "Comprehensive and Practical" field, and design and carry out comprehensive practical activities based on disciplinary knowledge. They should attach importance to creating situations for students to actively participate in practical scenarios, carefully design the steps of problem implementation in accordance with requirements, avoid thinking about activities using specific knowledge from teaching habits, and provide more guidance and less control to highlight the integration of comprehensiveness and practicality.

Teachers should continuously align their teaching practice with the requirements of the curriculum standard and

integrate theory with their own teaching practice. For example, the New Curriculum Standard clearly specifies the class hour design requirements for some themes, which have changed from at least once a semester to micro-unit teaching. Therefore, the class hour design for most themes requires about five sessions. Teachers need to design a series of class hours for a certain theme from shallow to deep, when preparing lessons to improve the learning activities of this theme [7].

4.3. Innovate the selection of teaching themes and content

Teachers should diversify their thinking to include diversified design in their design concepts; include the accumulation of relevant knowledge and teaching experience; and include the practice of exploring innovation in practice. Based on the teaching theme suggestions for each learning stage in the New Curriculum Standard, they can select theme content that is more in line with students' cognitive levels and closer to their real lives for teaching. At the same time, they should consider the complexity of teaching content and the completion of diversified teaching tasks. Teachers should accurately grasp the teaching theme content, actively carry out practical and operational teaching activities, guide students to participate in practical teaching activities, and actively summarize comprehensive practical experience in the field of mathematics.

Teachers should also appropriately guide students to select theme content themselves. When guiding, teachers can understand each student's preferences through questionnaires or individual conversations; ensure that the theme content independently selected by students is within the scope required by the curriculum standard to avoid ineffective work; provide alternative resources: teachers can provide books, websites, articles, etc., as alternative materials for students to select themes, so that students can more conveniently choose suitable themes and content [8].

4.4. Promote diversification of activity methods

In the teaching of "Comprehensive and Practical" courses, it is necessary to adopt various forms that fully reflect the two characteristics of comprehensiveness and practicality, and purposefully and planned cultivate students' mathematical comprehensive awareness and practical abilities, so as to implement the concepts of the New Curriculum Standard.

When designing teaching activities in the "Comprehensive and Practical" field, teachers should abandon the behavior of thinking about teaching with fixed teaching thinking, adopt a diverse perspective, use corresponding activity methods in different links, and design course activities in the "Comprehensive and Practical" field with a "flexible" thinking [9].

Teachers should also appropriately guide students to design activities themselves, and pay attention to diversified guidance when guiding to meet the needs and interests of different students. In this regard, the guidance to students can include the following methods: implementing group work to promote students' cooperation abilities, stimulate thinking and creativity; designing projects to enable students to make full use of learned knowledge and enhance their ability to handle problems.

4.5. Construct a diversified teaching evaluation system

The teaching evaluation of the "Comprehensive and Practical" field is different from that of other fields. The essence of comprehensive and practical activities is not the understanding and mastery of a specific knowledge point, but whether students gain practical experience in the activities, whether they break their thinking stereotypes when analyzing and solving problems, and then improve their comprehensive awareness. Therefore, the teaching of this field should develop innovative evaluation methods and multi-level feedback mechanisms, and restrict the teaching of this field in accordance with the requirements of the New Curriculum Standard.

Attention should be paid to the diversified development of students, and accurate evaluation of students' development in various aspects should be conducted. The evaluation content mainly includes students' overall quality, practical skills, mathematical skills, cooperative spirit, learning abilities, academic performance, etc., focusing on the combination of process evaluation and result evaluation. The functions of student self-evaluation, peer evaluation, and teacher group evaluation should be valued. The diversity of evaluation subjects can present the authenticity of evaluation results, expand

evaluation perspectives, effectively tap students' learning potential, and promote personal development [10].

5. Conclusion

In conclusion, the teaching of the "Comprehensive and Practical" module in primary school mathematics is still in the exploration and development stage, requiring continuous improvement in theoretical construction, teacher training, resource development, and other aspects. In the future, empirical research should be strengthened to form a promotable and effective teaching model, providing support for promoting the high-quality development of mathematics education and talent training.

Disclosure statement

The authors declare no conflict of interest.

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