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Classroom Teaching Practices and Reflections Guided by Mathematical Core Competency

-- A Case Study of “Basic Properties of Circles” Teaching Design

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Abstract: With the development of educational reforms in the new era, the Ministry of Education has introduced various new policies to adjust traditional educational approaches. The reform of new curriculum standards places the cultivation of subject core competencies at a key position in subject teaching, gradually advancing the educational system in China to new heights. Under the background of the new curriculum reform, focusing on the cultivation of core competencies as the starting point and foothold of education can better leverage the educational function of disciplines. Taking the teaching design of “Basic Properties of Circles” in junior high school mathematics as an example, students go through the process of forming the concept of circles, thereby cultivating their ability to think and solve problems using mathematical thinking, and improving the quality of classroom teaching.

Keywords: Junior high school mathematics; Core competencies; Teaching practice

Introduction

Under the guidance of mathematical core competencies, the cultivation of core competencies in mathematics education serves as a new goal. By updating educational concepts, innovating teaching plans, and optimizing educational methods, it can effectively enhance the practicality of education. Focusing on teaching students to observe the world with a mathematical perspective, perceive the real world with mathematical thinking, and express the real world with mathematical language, while optimizing classroom design, fully leveraging the dominant position of students in mathematics classrooms, is beneficial for helping students achieve comprehensive development. Based on this, this paper explores classroom teaching practice strategies guided by core competencies using the example of the "Basic Properties of Circles" teaching design.

1. Current Analysis of Junior High School Mathematics Core Competency Cultivation

1.1 Formal Integration of Educational Theory

Cultivating core competencies in junior high school mathematics emphasizes students' abilities in abstraction, geometric intuition, spatial concepts, reasoning, computational skills, model concepts, data concepts, innovative awareness, and application awareness. However, there are difficulties in integrating educational theories with practical teaching. In the process of educational achievement evaluation, the cultivation of students' core competencies is not yet set as an educational goal; there is excessive emphasis on teaching progress. In other words, the cultivation of core competencies remains superficial and does not realize its true educational value in specific teaching practices. Therefore, in the process of educational implementation, to better cultivate students' mathematical thinking, it is necessary to emphasize the integration of theory and practice, guiding practice with theory.

1.2 Relatively Monotonous Teaching Methods

Analyzing the current status of junior high school mathematics education, teaching methods are deeply influenced by the exam-oriented education concept. In the process of implementing mathematics education, students lack time and space for independent thinking and cooperative exploration. Actual teaching still follows a fixed process of previewing, classroom lectures, post-class review, and drill exercises, without fully reflecting the subjectivity of students in mathematics classrooms. Students' autonomy and initiative are not fully stimulated. In this teaching environment, it is not conducive to cultivating students' core competencies in mathematics or fully leveraging the educational function of the subject.[1]

2. Classroom Teaching Practices and Reflections Guided by Mathematical Core Competencies — A Case Study of "Basic Properties of Circles" Teaching Design

2.1 Pre-Classroom Flipping for Enhanced Previewing

Under the background of core competencies, to improve the quality of mathematics classroom teaching and cultivate students' core competencies in mathematics, attention should be paid to the design of flipped classrooms. Shifting from "teach first, learn later" to "learn first, teach later" can effectively improve the effectiveness of course previewing, making classroom teaching more targeted. In this process, the allocation of time inside and outside the classroom can be adjusted. The decision-making power of learning shifts from teachers to students. Instead of occupying classroom time to impart knowledge, teachers can record the teaching process as videos and share them in learning groups to facilitate students' autonomous learning. This flips the traditional, fixed educational model, making pre-class and post-class learning the new norm for students. In this new teaching model, students often organize doubtful parts in the process of autonomous learning and make key circled highlights, thereby participating in the classroom with questions to better enhance educational quality. The educational classroom will become a classroom for students to answer questions and clarify doubts, helping to better create a classroom that reduces burdens and increases efficiency and cultivates students' awareness and ability to think and learn independently.[2]

For example, in the teaching of "Basic Properties of Circles" in junior high school mathematics, clear preview goals can be set before class. The explanation of relevant knowledge can be prerecorded as a video and sent to the class group, transferring the initiative of learning to the students and stimulating their awareness of autonomous learning. During the process of autonomous previewing, middle school students explore the process of forming the concept of a circle, preliminarily exploring and mastering the positional relationship between points and circles, as well as the relationship between the radius of the circle corresponding to three positional relationships and the distance from the point to the center of the circle. In addition, in the preview process, for difficulties in previous learning, like the "perpendicular theorem's inference, " for understanding this mathematical knowledge, relevant knowledge can be integrated, and knowledge and abilities can be obtained in classroom teaching to cultivate students' awareness and ability to learn independently.

2.2 In-Class Micro-Lesson Videos for Developing Mathematical Thinking

In the application process of the new model of "Internet + Education" in the new era, for innovative design of teaching classrooms, in order to stimulate students' interest and enthusiasm in exploring mathematics classrooms, it is necessary to explain the targeted teaching of difficult and important knowledge. The process should apply micro-lesson videos, using videos, pictures, and other forms to present abstract theoretical knowledge in a vivid, vivid, and image-oriented way in the classroom, relative to, able to better stimulate the middle school students' autonomous and positive learning, to enhance the While\views and participation in the educational quality. In this process, the advantages of micro-lesson "short, small, and refined" applications can be demonstrated. By flexibly applying teaching videos, several knowledge points can be turned into micro-lessons, interspersed with actual educational content in the classroom, so that students can maintain a high level of attention throughout the entire class. To address students' doubts and questions in the process of previewing and classroom learning, targeted answers can be provided to ensure purposeful education. This approach helps in analyzing, discussing, and solving mathematical problems, gradually developing students' mathematical thinking and thus improving educational quality.[3]

For example, in junior high school mathematics, teaching "Basic Properties of Circles" includes the "perpendicular theorem's inference, " which states that "a diameter perpendicular to a chord bisects the chord and its arc." To explain this theorem, teachers can use micro-lesson videos to analyze the hypothesis and conclusion of the perpendicular theorem, helping students observe and analyze the graph, help students to translate the language of mathematics and language first showed the relationship between the circle's symmetry. Initially, the view of the diagram proposed showing symmetrical for inscribed angle, and subsequently led to a conjecture. Building on the symmetry of the circle, students further discovered equal line segments and arcs, attempting to generalize the perpendicular theorem. In this teaching activity, the application of micro-lesson videos enables students to gradually cultivate mathematical thinking through observation, analysis, discussion, and problem-solving processes, promoting competency-based education.

2.3 Post-Class Layered Homework Design to Improve Problem-solving Skills

In junior high school mathematics classrooms guided by core competencies, homework design can also start from the high-efficiency perspective, allowing homework to better serve the classroom and lay a solid foundation for creating efficient classrooms.[4] Under the new curriculum reform education teaching concept, we focus more on the development needs of students' individual differences. In this context, in the process of innovative homework design, it is necessary to design layered homework, combine different students' cognitive levels and learning levels, design homework content and homework difficulty, promote the development of individual differences, help students to enhance in-depth learning of mathematically knowledge, and research autonomous analysis problem-solving skills of course quality assist.

3. Conclusion

In summary, the design of junior high school mathematics classrooms guided by core competencies, using the example of "Basic Properties of Circles, " optimizes the pre-class preview, in-class learning, and post-class homework stages. This approach cultivates students' ability to think and solve problems using mathematical thinking while helping them develop good learning habits. It plays a crucial role in improving the quality of mathematics education.

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