

Changes of New Mathematics Curriculum Standards in Compulsory Education and Its Enlightenment to Teachers

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Abstract: The new mathematics curriculum standard for compulsory education is guided by core competence. Compared with the 2011 curriculum standard, it pays more attention to integrity, stage, practicality and integration. The changes of the new curriculum standards also have corresponding enlightenment for teachers: teachers should be prepared to adapt to the changes, strengthen mutual cooperation, pay attention to the overall organization of unit content, organize teaching in the form of exploration, use teaching methods to promote thinking, and emphasize the incentive of evaluation.

1. Introduction

In April 2022, the Ministry of Education issued the Compulsory Education Curriculum Standard (2022 Edition, hereinafter referred to as the new curriculum Standard). [1] The new curriculum standard highlights core competence on the whole. Core competence is the necessary character and key ability that students gradually form in the process of receiving the corresponding period of education to meet the needs of personal lifelong development and social development. [2] Compared with the three-dimensional goals mentioned before, core competence condenses knowledge and skills, processes and methods into abilities, and distills emotional attitudes and values into qualities, [3] emphasizing its comprehensiveness and integrity. The students' accomplishment to be cultivated in mathematics course is to observe the real world with mathematical vision, to think about the real world with mathematical thinking, and to express the real world with mathematical language. Next, this paper analyzes the changes of the new curriculum standard of mathematics in primary school from the essential characteristics of core competence.

2. The change of the new curriculum standard

Xin Tao et al. pointed out that the previous curriculum standards in China still failed to do a good job in the definition and systematic elaboration of the connotation of competence, the cultivation of interdisciplinary competence, and the connection between the goals of different stages. The new curriculum standard integrating core competence improves these three problems. In the new curriculum standard, there is a section devoted to explaining the connotation of core

competence, adding interdisciplinary thematic activities, and the objectives of each learning section are consistent with the core competence and progressive layer by layer. In addition, the new curriculum standard combines the characteristics of core competence: criticality, universality, integration, individuality and growth, [4] the characteristics of mathematics core competence: comprehensive, stage and persistence, [5] and the characteristics of students develop core competencies: commonality, development and teachable. It shows a more holistic, phased, practical and integrated state.

2.1. Paying more attention to integrity

First of all, the integrity is reflected in the connection between the core quality and the learning objectives, learning content and academic quality standards. The new curriculum standard expounds the extent to which the development of core competence in different learning stages should reach, such as: number sense, quantity sense, operation ability, symbol consciousness and space concept should be formed preliminarily in the first learning section and be formed completely in the second learning section. The new curriculum standard also expounds what kind of core competence should be promoted by different learning contents, such as the content "number and quantity", students experience the formation process from quantity to number, and initially realize that number is the abstraction of quantity, forming a sense of number and symbol consciousness. The new curriculum standard explains what standards students' core competence should meet in terms of academic quality. Compared with the previous curriculum standards, the new curriculum standards add academic quality standards. Academic quality combines content standards and core qualities to provide guidance for subsequent teaching evaluation. In this way, teaching objectives can reflect the core qualities that students need to develop. Content standards and teaching suggestions promote the formation of students' core competence. Quality standards are the specific embodiment of students' core competence in their studies. [6] The core quality is organically integrated with the learning objectives, learning content and academic quality standards.

Secondly, the integrity is reflected in the consistency between the theme of the learning content and the cohesion of learning goal in different stage. For example, in the "number and Algebra" module, students learn the same theme, "number and operation" and "quantitative relationship", at all stage in primary school. The learning contents at every learning stages are consistent, but they are not repeated, but phased and progressive. The main performance is: with the rise of learning stage, learning digit increase, such as from the number within ten thousand to the number beyond ten thousand; The range of numbers increases, as from positive to decimal to fraction; The improvement of computing ability requirements, such as from simple operation to hybrid operation; The requirement for understanding of the quantitative relationship and the transformation ability improves, the conversion of units of measurement, fraction and decimal conversion. Each study stage connects with each other and spirals upward.

Furthermore, the integrity is embodied in the organization and arrangement of knowledge structure. In the content of number and algebra module, the original "number cognition" and "number operation" are unified into "number and operation", and "common quantity" and "exploration law" are unified into "quantity relation". In the content of graphics and geometry module, "cognition of graphics" and "measurement" are integrated into "cognition and measurement of graphics", and "motion of graphics" and "position of graphics" are integrated into "motion and position of graphics". "Simple data statistical process" is refined into "data collection, collation and presentation". In the first section, "statistics and probability" is transformed into "data classification". From combination to separation, it reflects the phased and progressive nature of knowledge.

2.2. Pay more attention to stages

Stage is firstly reflected in the further division of the period. The division of learning stage comes into three period (1-2 grade for the first period, 3-4 grade for the second period, 5-6 grade for the third period) from the original two period (1-3 grade for the first period, 4 -6 grade for the second period) in elementary school. The division of study stage is finer, conforming to the characteristics of students' thinking development from concrete to abstract.

Stage is secondly reflected in the division of some core competence. Mathematics Curriculum Standards for Compulsory Education (2011 Edition) [7] has clearly proposed 10 core qualities of mathematics: number sense, symbol consciousness, spatial concept, geometric intuition, data analysis concept, operation ability, reasoning ability, model thinking, application consciousness and innovation consciousness, and explained their meanings. The new curriculum standard has a more detailed stage distinction of the development degree of core competence, for example, abstract ability is embodied in number sense, quantity sense and symbol consciousness in primary school. The cultivation of reasoning ability requires students to have reasoning consciousness first in primary school, while the cultivation of data concept and model concept requires students to form corresponding data consciousness and model consciousness first in primary school. The difference between reasoning consciousness and reasoning ability is that the former belongs to the category of cognition, that is, in the mind has a preliminary perception of the process and significance of reasoning, know what is reasoning; The latter belongs more to the category of practice, that is, can independently complete the process of reasoning to reach a conclusion, know how to reason. The difference between consciousness and idea lies in the different cognition degree. The former has the basic perception, while the latter needs to form a clear understanding. The cultivation and development of core competence is not accomplished overnight, and the phased differentiation better reflects the adherence to the law of children's physical and mental development.

2.3. Pay more attention to practice

Zhang Hua proposed that "practice is the mother of competence" [8], which shows that practice plays a fundamental role in the development of competence.

The new curriculum standard also attaches great importance to the comprehensive practical activity course. The writing length of comprehensive and practical modules has increased significantly. In the old version of the curriculum standard, the length of synthesis and practice is quite short. It only says "to experience the role of mathematics in daily life through practical activities", "to understand the problems to be solved and the solutions to the problems" and so on. The language description is not concrete, so many teachers do not attach importance to practical activities in practical teaching. In the module of integration and practice of the new curriculum standard, the length has increased significantly, and each learning stage has arranged a number of themed activities, such as "digital game sharing", "happy shopping trip", "My classroom" and so on. The purpose of each theme activity is specified, and some of the corresponding teaching cases are attached, which has strong guidance.

Teaching suggestions and evaluation suggestions further emphasize the comprehensive practicality. In the old version of the curriculum standard, the teaching suggestion of comprehensive and practical content was "reasonably grasp the implementation of 'comprehensive and practical'", but in the new curriculum standard, the expression has been changed to "further strengthen the comprehensive and practical". In addition, the evaluation suggestion of the new curriculum standard proposes that attention should be paid more to the four basic and four abilities of students, and especially the formation and development of students' core competence. In the aspect of academic level test, the questions of application, comprehensiveness and inquiry type should be improved

appropriately. For a long time in the past, schools, teachers and parents unilaterally pursue students' scores and enrollment rate, resulting in quality-oriented education is difficult to really imply, so the establishment of education quality evaluation system oriented by core competence will promote the transformation of exam-oriented education to quality-oriented education.

2.4. Pay more attention to integration

Thematic activities highlight interdisciplinary nature. For example, themed activities such as "Water is the source of Life" and "Nutritious Lunch" combine mathematics with biology and chemistry, which is beneficial to students' ability to investigate and solve problems while understanding relevant subject knowledge. The themed activity "Mathematics in Sports" combines mathematics with physical education, so that students can look at sports related events from the perspective of mathematics while exercising.

Strengthen links with student life and integrate students' daily experiences. For example, in the first learning period, students should combine their existing experience in kindergarten with interesting games and activities. Comprehensive and practical activities use familiar body parts and learning places to describe directions and locations. Students draw a campus plan to learn about scale, direction, location and measurement.

3. Implications for teachers

In order to promote the development of students' core competence, teachers are required to generate corresponding teaching competence. Teachers should be well prepared to adapt to the new curriculum standards in terms of cognition, strengthen cooperation with other teachers, pay attention to grasp the integrity and integration of knowledge in teaching, organize teaching in the form of inquiry, use teaching methods to promote thinking, and emphasize the incentive of evaluation.

3.1. Be prepared to adapt to changes in the curriculum standard

First of all, teachers should correctly understand the change of the new curriculum standard. Although the changes in the new curriculum standards will make some teachers feel uncomfortable, teachers must clearly realize that the introduction of the new curriculum standards is the inevitable result of human quality and social development, and understand the significance of the changes in the new curriculum standards. In order to promote the personalized development of students and make their development beneficial to the development of society, corresponding changes must be made to the curriculum standards. Teachers should adjust their attitude to meet the changes brought about by the implementation of new curriculum standards. Secondly, teachers should further study and enrich their knowledge reserve. The new curriculum standards pay more attention to interdisciplinary teaching, teachers only master the knowledge of the subject they teach can not meet the requirements of teaching. As the saying goes, "to give students a glass of water, the teacher should have a bucket of water". In order to adapt to the changes in the implementation of the new curriculum standard and implement the curriculum implementation under the guidance of the new curriculum standard, teachers need to be knowledgeable, good at discovering the combination of knowledge between different disciplines and master more skills.

3.2. Strengthen the cooperation among teachers

On the one hand, teachers of different disciplines should strengthen exchanges and cooperation.

Based on the needs of interdisciplinary teaching, teachers of different disciplines can fully exchange knowledge systems and unit teaching arrangements of their respective disciplines, find the connection points between disciplinary knowledge and appropriate teaching opportunities, and jointly design the corresponding interdisciplinary themed activities. To promote students to understand knowledge from a macro level, be good at integrating knowledge, and be able to find problems, ask questions, use interdisciplinary perspective and thinking to solve problems. On the other hand, teachers in the teaching and research group should work together to interpret the changes of the new curriculum standard and implement the new curriculum standard according to local conditions. The subject leader should lead the subject teachers to formulate appropriate strategies for the implementation of the new curriculum standards according to the existing resources, teaching environment, teachers' teaching and management ability, and carry out detailed work plans and arrangements, so that the teachers can aim at the target in the following teaching.

3.3. Pay attention to the overall organizational unit content

Teachers should pay attention to grasp the subject and the target of the subject unit, reasonably link up the knowledge content in the unit, sort out the relationship between the knowledge from the Angle of vertical level and horizontal connection, connect the knowledge in series, guide students to master the knowledge on the whole, and avoid the phenomenon of fragmentation of the knowledge. Professor Chung pointed out that lesson planning should never be separated from unit design. [9] Therefore, teachers are required to carry out reasonable unit design, so as to make the connection between class hours step by step and achieve the effect of enabling students to review the past and learn new things.

3.4. Organize teaching in the form of inquiry

In thematic activities, it has considerable advantages to organize the learning of course content in the form of "theme-inquisition-expression". The new curriculum standard has added many thematic activities, and inquiry-based learning is very suitable for such activities. Teachers define the theme of the activity, teachers or students put forward exploratory questions, teachers organize students to communicate and explore, students gradually form concepts and draw conclusions in the exploration, and finally students expound their thoughts and results. Inquiry activities can not only deepen students' impression on knowledge, but also improve students' ability to solve problems. In addition, in general mathematics class, teachers can also use this kind of form to organize teaching, create appropriate teaching situation, present inquisitive questions to promote students' thinking. [10] Teaching in the form of "target-achievement-evaluation" also has certain advantages, that is, it is efficient in the dissemination of knowledge, but to a certain extent, it restricts students' thinking and weakens the exercise of thinking. Therefore, teachers should pay attention to balance the acquisition of students' direct experience and indirect experience.

3.5. Using teaching methods to promote thinking

Teachers should flexibly use experimental methods and discussion methods in class to stimulate students' thinking development and promote students' cooperation and communication. Throughout the years of teaching history, teaching method and demonstration method are still the most commonly used teaching methods by teachers and occupy a relatively high proportion of classroom time. This kind of teaching method pays more attention to students' mastery of knowledge points. While the core competence-oriented mathematics curriculum aims not only emphasize that students can acquire four basic and four basic qualities, but also pay attention to the formation of students'

necessary mathematical characteristics, such as good at observation, clear logic, careful thinking, rigorous science and innovation, etc. Experimental method gives students the opportunity to use instruments and equipment to explore independently, discover rules, summarize rules, and experience the scientific nature of mathematics. Discussion method is conducive to the formation of an active classroom atmosphere, between students, between teachers and students to stimulate the collision of thinking, burst out novel ideas, and then through the analysis to make up for the loophole of thinking, correct mistakes, get the correct conclusion. Therefore, teachers should properly let go of students' hands, avoid grasping too tight, give more chance to students.

3.6. Emphasize the incentive of evaluation to students

The new curriculum standard requires that the evaluation pay attention to the development of students' core competence. In terms of the content of evaluation, teachers should pay attention to the evaluation of students' performance and results in the learning process during the course implementation, observe the degree of students' participation in inquiry, their thinking on problems and proposed solutions, motivate students' careless attitude of solving problems and monitor their own learning behaviors. Avoid focusing solely on the evaluation of students' mastery of knowledge points, because the accumulation of knowledge does not necessarily lead to the development of competence, but the development of competence is inseparable from the accumulation of knowledge, so we should uphold the principle of "less but better" and abandon too complicated knowledge points. From the perspective of the subject of evaluation, it is necessary to avoid the situation that the subject of evaluation is too single. If all the right of evaluation is concentrated in the hands of teachers, students will be in a relatively passive position. Therefore, the form of mutual evaluation between students can be increased, which is conducive to students' learning from each other when reading and evaluating the learning achievements of others. At the same time, it is also conducive to promote students to analyze their own learning situation, have a clearer understanding and clear learning objective of their own in the next stage.

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