

Research on the Dilemmas and Strategies of Interdisciplinary Theme Teaching in Primary School Mathematics

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Abstract: Based on policy text analysis and semi-structured interviews with 12 front-line teachers, this paper sorts out the value, predicaments and improvement paths of interdisciplinary theme teaching in primary school mathematics. The research finds that the three major bottlenecks restricting its implementation are teachers' weak interdisciplinary awareness, the superficial implementation of the curriculum, and the single evaluation system. Therefore, strategies such as building a three-dimensional training chain of "region - school - individual", expanding resources within and outside the school, and establishing a dynamic evaluation mechanism combining process and result are proposed to enhance students' knowledge integration ability and comprehensive quality.

Keywords: Primary school mathematics; Cross-disciplinary thematic teaching; Realistic context; Knowledge integration; Dynamic evaluation

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With the deepening of teaching reforms, interdisciplinary thematic teaching has become an important approach for cultivating students' comprehensive qualities. The Notice issued by the General Office of the Ministry of Education on the "Action Plan for Deepening the Reform of Basic Education Curriculum and Teaching" clearly states that cross-disciplinary integrated teaching should be strengthened, and a number of excellent cases of interdisciplinary comprehensive practical teaching should be selected and promoted. Students should learn through practical exploration. The "Compulsory Education Curriculum Plan (2022 Edition)" also explicitly states, "In principle, each course should allocate no less than 10% of the class hours for cross-disciplinary theme learning."^[1]

During the process of conducting interdisciplinary thematic teaching, teachers should start from students' experiences to explore thematic resources, and take core questions as the orientation. Through cooperative and exploratory learning, students can acquire knowledge, develop skills, and cultivate innovative consciousness. This article begins with the value connotation and existing problems of interdisciplinary thematic teaching in primary school mathematics, and explores the strategies of interdisciplinary thematic teaching. It is hoped that this research can help students construct a knowledge system integrating multiple disciplines and comprehensively enhance their comprehensive literacy.

1. Definition and Value Significance of Interdisciplinary Theme-based Teaching

1.1 The essence of interdisciplinary thematic teaching

Interdisciplinary teaching places great emphasis on students' life experiences. It focuses on the discovery, analysis and resolution of profound social issues in the context of diverse cultures in society. It can strengthen the connection between subjects and social life. Many primary and secondary schools as well as research experts have devoted themselves to the study of interdisciplinary thematic teaching, hoping to develop new types of interdisciplinary teaching models that are suitable for the age development characteristics and social life experiences of students.

Ren Xuebao (2022) believes that "interdisciplinary thematic teaching" possesses two characteristics: "interdisciplinarity" and "theme coordination". It requires adhering to the disciplinary stance while breaking through disciplinary boundaries. Under a specific theme, it integrates the contents of different disciplines, organizes various teaching elements around the theme, conducts comprehensive teaching design and implementation based on problem orientation, and promotes the teaching concept and practice for students' all-round development. ^[2] Pu Mengke (2024) believes that interdisciplinary thematic teaching is a teaching practice method that designs teaching based on the

theme, connects the knowledge and skills of different disciplines, comprehensively links the practical value of different disciplines, and cultivates students' practical ability and innovative consciousness. [3]

Interdisciplinary thematic teaching has the characteristics of practicality, comprehensiveness and situationality. It requires teachers to be good at discovering relevant life experiences related to interdisciplinary subjects around them, actively condensing interdisciplinary teaching themes, and increasing students' practical experience of life during class. Interdisciplinary learning does not mean eliminating disciplines; rather, it means adhering to the essence of disciplines while breaking their boundaries and combining knowledge from other disciplines to promote the generation of knowledge in the current discipline and the cultivation of students' qualities. In summary, we believe that interdisciplinary thematic teaching is a teaching practice method that selects real thematic situations to help students integrate the internal logic between different disciplinary knowledge to solve practical problems in life and promote the all-round development of students.

1.2 The Value and Significance of Cross-disciplinary Teaching in Primary School Mathematics

Cross-disciplinary thematic teaching emphasizes the integration of different disciplines, promoting the cultivation of students' comprehensive qualities, and enhancing their ability to identify, pose, and solve problems in real-life situations. Therefore, it is of great significance to deeply explore the cross-disciplinary thematic teaching model in primary school mathematics teaching.

1.2.1 Update teachers' teaching concepts

Traditional primary school mathematics teaching mainly focuses on the systematic imparting of single subject knowledge. Currently, single subjects still dominate the learning model of students. If the mathematics subject merely focuses on the learning and application of mathematical formulas and principles, it will to some extent limit the cultivation of students' comprehensive abilities. In interdisciplinary theme teaching, teachers can construct life-oriented problem scenarios, design open-ended interdisciplinary teaching practices, guided by core issues and driven by tasks, and by means of practical carriers, they can organically connect mathematical concepts with knowledge from other subject areas, forming a multi-dimensional cognitive network. This can stimulate children's active thinking about problems, foster strong adaptability and creativity. It prompts teachers to abandon the traditional single-subject teaching concept, leads teachers to actively explore and innovate interdisciplinary integration teaching models, continuously update their teaching concepts, and promote their own professional development.

1.2.2 Enhancing students' comprehensive literacy

The traditional teaching methods neglect the cross-fertilization between different subjects and the practicality of knowledge, which is not conducive to cultivating students' ability to solve practical problems and the development of their innovative thinking. Cross-disciplinary thematic teaching strengthens the integration of subjects, closely links with students' life experiences, and through activities such as group cooperation, hands-on operations, and practical exploration based on a life theme, enables students to understand the essence of the mathematics subject and enhance their cross-disciplinary perspective and lateral thinking. This is beneficial for the holistic and multi-dimensional development of students. Therefore, selecting themes that are in line with students' life experiences in primary school mathematics and designing corresponding cross-disciplinary thematic teaching activities is of great significance.

2.The Current Challenges of Cross-disciplinary Theme Teaching in Primary School Mathematics

Currently, cross-disciplinary theme teaching in primary school mathematics encounters numerous problems and challenges in the actual teaching process, which directly affect the implementation effect of teachers' cross-disciplinary theme teaching. This article uses the literature analysis method and combines the interview results of primary school mathematics teachers on the front line to analyze the current practice of cross-disciplinary theme

teaching in primary school mathematics, and summarizes the actual problems faced by schools and teachers in carrying out cross-disciplinary theme teaching.

2.1 Weak cross-disciplinary teaching awareness of teachers

Teachers, as the main implementers of teaching activities, their teaching cognitive level directly affects the learning effect of students. Jiang Liping (2023) believes that in teachers' cognition, there are two aspects of problems: insufficient understanding of the value and connotation of cross-disciplinary theme teaching, and insufficient understanding of the learners of cross-disciplinary theme learning. ^[4] The problem of weak cross-disciplinary awareness of teachers does not only exist at the theoretical level, but has also been confirmed in practical research. Below are the detailed interview contents with three primary school mathematics teachers on the front line.

Through interviews with front-line teachers, it was learned that these three teachers mentioned that many teachers around them were not clear about the essence of interdisciplinary theme teaching, especially among teachers in rural areas and older teachers. The main reason for this is that in actual teaching, schools did not set out relevant cross-disciplinary teaching task requirements, and teachers did not carefully study the reform direction of the new curriculum standards. Schools and teachers tended to teach according to the prescribed teaching content of the state, believing that interdisciplinary theme teaching would increase students' learning burden and affect their mastery of mathematics subject knowledge. Moreover, the current examination and evaluation mechanism was not applicable to it.

It can be seen that most teachers are still influenced by the traditional evaluation system, and the idea of "only focusing on scores" is deeply rooted. They lack a deep understanding of how subject integration can serve the cultivation of core competencies. They believe that interdisciplinary thematic teaching is optional and simplify it to the mere assembly of multiple disciplines' knowledge, neglecting the integration of themes and the orientation towards solving real problems. Therefore, there is a situation where teachers have weak awareness of interdisciplinary thematic teaching.

2.2 Interdisciplinary teaching becomes merely a formality

Under the model where subject-based teaching is dominant, although teachers can deeply explore their respective subject areas, due to the constraints of the traditional examination and evaluation system, when faced with interdisciplinary teaching tasks, they often adopt a simple and cursory approach, lacking the energy to integrate knowledge from multiple disciplines. As a result, they are unable to design interdisciplinary courses that are innovative and comprehensive. To address this issue, a survey was conducted among three primary school mathematics teachers. The following is the specific interview content.

During the interview, two teachers believed that due to the lack of an overall understanding of different subject knowledge systems, cross-disciplinary teaching activities merely amounted to a simple combination of different subjects, resulting in the phenomenon of "crossing but not integrating" among subjects. Another teacher pointed out that the primary school mathematics subject has strong subject uniqueness, with calculations accounting for a large proportion. It is very difficult to conduct cross-disciplinary teaching. Only when teaching plans need to be prepared or when teaching skills competitions are required, will cross-disciplinary teaching designs be specially carried out. However, in the daily teaching process, due to insufficient teaching experience, limited teaching practice time and space, teachers rarely have the opportunity to practice the concept of cross-disciplinary teaching, making cross-disciplinary theme teaching practices often become merely formalities.

In the temporal dimension, each discipline has its own teaching syllabus and teaching schedule requirements. Teachers have heavy and tight teaching tasks. Although there are integrated practical courses in the school's curriculum schedule, in reality, the time is still occupied by the specific discipline, making interdisciplinary teaching difficult to implement. In the spatial dimension, the cross-disciplinary thematic learning venues in schools are relatively closed. Research has found that nearly 80% of schools' cross-disciplinary thematic learning mainly takes

place in classrooms or school activity rooms. [5] 64 Interdisciplinary thematic teaching in primary school mathematics requires specific venues, such as mathematics laboratories, geometric model rooms, and campus outdoor areas, but the school's space is limited and cannot meet the requirements for the practice venues of interdisciplinary teaching. The school's ability to integrate resources outside the campus is weak, making it difficult to link social venues, natural scenes, etc. to establish a three-dimensional teaching field. In reality, interdisciplinary thematic teaching faces difficulties such as time-space limitations and relatively scarce resources like teaching platforms, which affect the implementation of teaching activities.

2.3 Incomplete interdisciplinary evaluation system

The evaluation of interdisciplinary thematic teaching should focus on the development of students' core competencies and their ability to solve practical problems. Research has shown that 52.2% of interdisciplinary thematic learning only has a preliminary learning evaluation form and no clear and specific evaluation indicators have been formulated. [5] 63 To understand the implementation situation of teachers' comprehensive evaluations of students in actual teaching, interviews were conducted with three primary school mathematics teachers. The interview content is as follows.

Through interviews with front-line teachers, two teachers mentioned that due to the lack of a corresponding teaching and learning assessment and evaluation system for interdisciplinary teaching, some teachers did not attach much importance to the teaching content of this module and did not design specific evaluation measures aimed at the development of students' comprehensive competencies. They mostly relied on oral evaluations in class.

Zhu Hongwei (2024) believes that the current cross-disciplinary course evaluation goals are overly simplistic and fail to comprehensively cover the core competencies and overall development needs of students. [6] The evaluation goals play a guiding role in teachers' teaching and students' learning. A single evaluation goal leads to the difficulty of accurately reflecting students' real gains and growth in the cross-disciplinary learning process.

He Shengguo (2025) believes that currently, the cross-disciplinary teaching evaluation system is not perfect, and the evaluation methods are relatively simple, lacking diversity and flexibility, and are unable to comprehensively and objectively reflect students' comprehensive abilities and current development levels. [7] The current evaluation system often focuses on the quantitative assessment of subject knowledge points, but neglects the qualitative tracking of holistic thinking, practical innovation ability, and non-cognitive qualities. The evaluation subject also has a structural deficiency, and students' self-assessment and reflective expression as learning subjects are not included in the evaluation framework.

3.Improvement Strategies

3.1 Establish a multi-dimensional training system and activate the concept of interdisciplinary integration

The current training mainly focuses on single-subject teaching methods, and there is a scarcity of cross-disciplinary training courses. [8] Currently, the teacher training system has severe disciplinary barriers and the cross-domain collaborative training mechanism needs to be improved. To break through this predicament, a three-dimensional implementation plan can be constructed. Firstly, establish a regional teaching research community and hold "Crossing Boundaries and Coexistence" themed training activities on a regular basis within the teaching area. Through inter-school joint lesson planning and excellent lesson demonstrations, a knowledge sharing ecosystem can be formed. Secondly, strengthen school-based training. Each school can establish a biweekly training system and systematically carry out "theme-based teaching" workshops. The activities should focus on sharing cross-disciplinary integration lesson examples and the new curriculum standards reflected in the lesson examples. Finally, implement a precise assistance plan. For rural teachers and senior teachers with more than 20 years of teaching experience, design a training program of "concept immersion and practical transformation", covering aspects such as cross-disciplinary cognitive construction, classroom scenario creation, and the establishment of a diversified evaluation system, to gradually overcome the difficulties that veteran teachers have in cross-disciplinary

teaching.

3.2 Expand teaching resources and increase the depth of teaching practice

Interdisciplinary thematic teaching places great emphasis on contextualization, and delving into a real context often requires sufficient teaching resources. Only when there are adequate multimedia courseware, teaching reference books, teaching tools, time and space and other teaching resources can cross-disciplinary teaching practice be fully carried out. Therefore, schools should strengthen top-level design. Firstly, schools should purchase corresponding teaching reference books, teaching aids, etc. for teachers according to the characteristics of interdisciplinary themes for different grades to ensure that teachers have sufficient cross-disciplinary teaching resources. Secondly, not only should teachers ensure that cross-disciplinary teaching is reflected in each class period, but also arrange a block of teaching time for teachers to carry out cross-disciplinary teaching practice to ensure the time for cross-disciplinary teaching. Finally, schools should strengthen cooperation and communication with off-campus museums, sports venues and communities, so that schools can arrange students to conduct practical activities in off-campus social venues, continuously meeting students' learning needs.

3.3 Establish a dynamic evaluation system and emphasize comprehensive ability cultivation

Under the guidance of core literacy, establishing a dynamic evaluation system can create a closely connected and highly efficient classroom teaching outcome. First, teachers must firmly grasp the process orientation and deeply integrate process-based evaluation with result-based evaluation. Teachers should precisely assess the compatibility between teaching objectives and the development of students' literacy, and when facing comprehensive problems, be able to quickly identify whether students can focus on the core theme, ingeniously integrate knowledge from multiple disciplines, and achieve cognitive advancement and literacy improvement. Secondly, introduce multiple stakeholders' evaluation. Establish a multi-perspective evaluation system that integrates student self-evaluation, peer evaluation, and teacher evaluation. Students can become managers of their own learning through self-evaluation, peer evaluation can build a collaborative community, and teacher evaluation provides guidance for students' learning improvement. Only by having the three parties' evaluations mutually confirm and dynamically complement each other can we truly achieve the goal of "promoting learning through evaluation and promoting teaching through evaluation", and implement the cultivation of core literacy. Finally, carefully design multi-dimensional evaluation indicators. The evaluation indicators should comprehensively cover multiple dimensions such as knowledge transfer, practical innovation, and emotional attitude, and make a three-dimensional assessment from aspects such as knowledge construction, team collaboration, cognitive leap, and outcome generation, providing precise and complete evaluation standards for the integration of teaching, assessment, and evaluation.

Interdisciplinary theme-based teaching, as one of the effective teaching models for cultivating mathematical literacy, can effectively overcome the limitations of fragmented knowledge and the disconnection between theory and practice in traditional single-subject teaching. It aligns with the requirements of the new era for the application of knowledge and innovative talents. Currently, this teaching model has demonstrated significant practical value in integrating knowledge from primary school mathematics and other subjects and enhancing students' problem-solving abilities. Primary school mathematics educators need to deepen the practice and research of interdisciplinary teaching to help improve students' comprehensive literacy.

References:

- [1] Ministry of Education. Compulsory Education Curriculum Plan(2022 Edition)[S]. Beijing: Beijing Normal University Press, 2022: 11.
- [2] Ren Xuebao. The Connotation, Challenges and Breakthroughs of Cross-disciplinary Theme Teaching[J]. Curriculum, Textbook, and Teaching Methodology, 2022, 42(04): 59-64+72.

- [3] Pu Mengke,Kang Zhao.The Connotation and Implications,Challenges and Improvement Paths of Cross-disciplinary Theme Teaching[J].Basic Education Research,2024,(17):39-43.
- [4] Jiang Libing,Wang Yiran.The Practical Challenges and Overcoming Paths of Cross-disciplinary Theme Teaching [J].Contemporary Education Science,2023,(07):36-42.
- [5] Peng Yanhong,Xu Jinhai.The Implementation Status,Restricting Factors and Countermeasure Analysis of Cross-disciplinary Theme Learning in Primary and Secondary Schools[J].Education Research,2024,(08):61-67.
- [6] Zhu Hongwei.The Construction and Implementation of Cross-disciplinary Theme Learning Evaluation-Taking the"Compound Line Graph"in Primary and Secondary School Mathematics as an Example[J].Primary and Secondary School Classroom Teaching Research,2024,(10):52-56.
- [7] He Shengguo,Qi Junmei.Teaching Practice and Reflection on Cross-disciplinary Integration in Primary School Mathematics[J].Basic Education Forum,2025,(03):36-38.
- [8] Yang Jie,He Yuzhe,Zheng Yonghe.The Current Situation and Improvement Paths of Science Teachers'Cross-disciplinary Teaching Ability[J].Primary and Secondary School Science Education,2024,(04):27-32.