

*Original Paper*

# Research on Class Management Strategies for Constructing a Positive Mathematics Learning Community: With the Goal of Promoting In-depth Mathematics Learning

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## **Abstract**

*With the goal of promoting students' in-depth mathematics learning, this study focuses on the construction of class management strategies for a positive mathematics learning community. By analyzing the existing problems in the construction of mathematics learning communities and the practice of class management, and based on the learning community theory, in-depth learning theory and class management theory, specific management strategies are proposed from the dimensions of class culture construction, design of student communication systems and construction of interaction mechanisms. The study finds that scientific class management strategies can effectively promote the sound operation of mathematics learning communities, and provide environmental guarantee and motivation support for students' in-depth mathematics learning.*

## **Keywords**

*Mathematics learning community, Class management, In-depth learning, Management strategies, Mathematics teaching*

## **1. Introduction**

### *1.1 Research Background*

The “learning community” is an important concept in the relevant field. Ferdinand Tönnies, a German sociologist, first put forward “community” as a sociological concept, emphasizing the “commonality” among social individuals. Later, John Dewey associated the concepts of “democratic community” and experimental schools in *Democracy and Education*, formally introducing it into the field of pedagogy. Since then, with the continuous changes of society, the connotation and extension of the “learning

community” have been expanding. Manabu Sato, a Japanese educator, broke away from the abstract discussion of educational theories in his book *The Quiet Revolution*, providing feasible strategic references for teachers’ actual teaching, which also greatly promoted the research on the development of modern “learning communities”.

With the in-depth advancement of the curriculum reform in basic education, “in-depth learning” has become an important goal in the field of mathematics education. The *Compulsory Education Mathematics Curriculum Standards (2022 Edition)* clearly states that it is necessary to “guide students to participate actively and cooperate and communicate, experience the formation and application process of mathematical knowledge, and promote students’ in-depth understanding of the essence of mathematics” (Ministry of Education of the People’s Republic of China, 2022). However, the phenomenon of “teacher-centered classroom and students’ passive acceptance” in the cramming teaching mode still exists in current primary school mathematics classrooms. Students lack opportunities for active exploration and cooperative communication in the learning process, and it is also difficult for them to achieve in-depth construction of mathematical knowledge. As the main place for students’ learning, class management strategies have a direct impact on the formation of the class mathematics learning community and the occurrence of students’ in-depth mathematics learning. The research on strategies for constructing a positive mathematics learning community through class management has become a hot research topic to improve the quality of mathematics teaching.

### *1.2 Research Significance*

This study has both theoretical and practical significance. Theoretically, based on the learning community theory and in-depth learning theory and by synthesizing existing research findings, it explores class management strategies for facilitating the construction of a positive mathematics learning community in mathematics teaching, which not only enriches the relevant research system of mathematics learning communities but also expands new research directions for the development of class management theory in the field of mathematics education. Practically, the research on feasible class management strategies can provide frontline mathematics educators with specific strategic references for constructing mathematics learning communities, thereby promoting students to achieve in-depth learning in mathematics study, enhancing their core mathematical literacy, and effectively improving their mathematics learning effects.

## **2. Theoretical Basis**

### *2.1 Learning Community Theory*

A “learning community” refers to a happy learning organization with democracy, equality, rule constraints, mutual care and common progress, where learners communicate with others to achieve a common learning vision, and generate the meaning of knowledge and construct it independently in the interaction process (Chen & Wu, 2024). It emphasizes the sociality, interactivity and situationality of learning. Its emergence reflects the reflection and criticism of traditional education and instrumental

rationality in an educational environment that is alienating towards a mechanical and objective direction (Sato, 2004).

### *2.2 In-depth Learning Theory*

“In-depth learning” was first proposed as a branch of machine learning. In 1976, Ference Marton and Roger Saljö, two Swedish psychologists, first put forward the “dual model of learning approaches—surface learning and deep learning” based on their observation of college students’ reading behavior, and defined it in the educational context: on the basis of understanding, learners establish connections between new knowledge and their existing cognitive structure, and realize the transfer and application of knowledge through high-order thinking activities such as analysis, synthesis and evaluation. In the mathematics discipline, in-depth learning is manifested as “students’ ability to understand the essence of mathematical concepts, master mathematical thinking methods, use mathematical knowledge to solve complex problems, and form critical thinking and innovative awareness”.

### *2.3 Class Management Theory*

“Class management” refers to “a comprehensive activity in which teachers organize, guide and coordinate various factors by adopting appropriate methods according to certain principles and objectives, plan, organize, coordinate and control various resources in the class, create a good class environment to achieve educational goals, and it is also an important means to achieve class educational goals” (Li, 2022). The core feature of modern class management theory is to emphasize student-centeredness, attach importance to democratic management, autonomous management and cooperative management, which is highly consistent with the concept of constructing a positive learning community.

## **3. Analysis of the Current Situation of Class Management in a Positive Mathematics Learning Community**

### *3.1 Existing Problems in Current Class Management*

There exist multiple problems in current class management. Some teachers still adopt the traditional teacher-centered management and teaching approaches for their classes: in terms of class management, they regard it as an exclusive right of teachers, leaving students merely as executors of class affairs without the right to participate in relevant decision-making, which results in extremely low student participation in class management, a weak sense of belonging to the class and poor effectiveness of class management; in classroom teaching, teachers dominate the class and adopt one-way cramming teaching to complete teaching tasks, making students passively accept knowledge and hindering the cultivation of their good learning attitude of active exploration. Meanwhile, there is a lack of interaction among students, while communication between them can not only enhance their sociality—cooperative communication in class can promote mutual mastery of knowledge and foster a sense of cooperation, and after-class communication can strengthen friendship among students, boost

their collective sense of honor and facilitate harmonious coexistence in the class—but also effectively improve their communication skills. As a matter of fact, effective communication is crucial for learning, work and life. In the 21st century, an era of globalization and informatization featured by complex changes, growing uncertainty and intensified competition, communication skills have even become one of the universally recognized core competencies by many countries and international organizations, including the ability to express one's own ideas clearly and explicitly, listen effectively and understand others' viewpoints, think from others' perspectives, and use body language appropriately (Chu, 2018). In addition, the evaluation method is relatively single. In October 2020, the *Overall Plan for Deepening the Reform of Educational Evaluation in the New Era* issued by the Central Committee of the Communist Party of China and the State Council clearly proposed that priority should be given to reforming the evaluation methods and content for primary and secondary school students, highlighting the implementation of comprehensive quality evaluation of students, abandoning the traditional score-oriented evaluation method and conducting student evaluation from multiple dimensions. However, scholars have found in their research that some schools still take scores as the main evaluation index in actual teaching and pay insufficient attention to the evaluation of non-quantitative indicators, which makes student evaluation unable to fully reflect their comprehensive quality and also difficult to effectively stimulate students' internal motivation for learning (Wang & Xu, 2023).

### 3.2 Analysis of the Causes of the Problems

There are multiple factors contributing to the various problems in current class management. First and foremost, teachers hold outdated educational concepts, and the fundamental reason for their rigid adherence to conventional practices in class management and teaching is the failure to update their educational concepts, making it difficult for them to make rational adjustments to adapt to the development and changes in education. For instance, the phenomenon of teachers having the final say in class management arises from their insufficient understanding and outdated cognition of the concepts related to learning communities and in-depth learning—they merely regard class management as a means of maintaining discipline, while ignoring its important value in driving students' in-depth learning. Second, there is a lack of sound strategic design. Students have limited energy, so ordinary daily communication can only reach a small number of classmates and cannot cover the entire class. Teachers should formulate scientific and reasonable communication strategies to help students expand the scope of communication, thereby facilitating the construction of a learning community. However, in reality, some teachers either ignore student communication or even deliberately curb it, which is essentially a prominent problem in the formulation of class management strategies. Third, there is a shortage of resource support. For teachers to conduct multi-dimensional evaluations of students and accurately assess their comprehensive quality, a great deal of time and energy must be invested. Yet a single teacher, while balancing teaching tasks and various non-teaching tasks, can hardly conduct long-term observation and comprehensive evaluation of all students in the class with guaranteed quality and quantity. The achievement of this goal requires more teaching staff and greater investment in

evaluation-related resources as support.

#### **4. Class Management Strategies for a Positive Mathematics Learning Community**

##### *4.1 Building a Positive Culture of Mathematics Learning Community*

A large number of domestic and foreign studies have shown that there is a relationship between class climate and academic achievement, and most of them believe that there is a positive correlation between class climate, namely class information climate, and academic achievement (Cai, 2024). Therefore, to build a good positive mathematics learning community and thus promote students' in-depth learning of mathematics, the construction of a class learning climate is very important. The shaping of the class climate for mathematics learning can be carried out from the following aspects:

##### **1. Defining Common Learning Goals**

Under the guidance of teachers, students in the class jointly formulate the class mathematics learning goals, such as "All students in the class develop the habit of jointly discussing 3 mathematical problems every week this semester" and "All students in the class improve their mathematical problem-solving ability by 15% this semester". Common learning goals help to enhance students' sense of belonging and collective honor to the class.

##### **2. Cultivating a Learning Climate of Cooperation and Exploration**

Set aside one mathematics sharing class every week to display students' results of cooperative exploration in mathematics, or let students share their problem-solving ideas, learning experiences and puzzles of the week. Teachers should give timely affirmation and other positive feedback when students share, and make good use of praise to enhance students' self-confidence.

##### **3. Establishing a Class Interpersonal Relationship with High Respect and Inclusiveness**

Teachers should carry out anti-bullying education for students through daily learning, guide students to respect different thinking modes and learning progress, avoid malicious behaviors such as ridicule and belittlement among students, clearly define and discipline bullying behaviors by formulating strict class rules, form an interpersonal atmosphere of mutual tolerance and understanding within the class, and build an equal and respectful inter-class relationship between classes (Zhang, 2019).

##### *4.2 Designing a Multi-dimensional Interactive Cooperation Mechanism*

A multi-dimensional activity mechanism helps to strengthen communication among students, construct a positive mathematics learning community, and promote students' in-depth learning of mathematics. The establishment of a multi-dimensional interactive cooperation mechanism can be carried out from the following aspects:

##### **1. Scientific and Reasonable Grouping and Task Allocation**

In class, teachers can appropriately arrange group discussion tasks to strengthen student communication, but the grouping should be scientific. Students in the class can be divided into 4 to 6 groups according to their mathematical ability, personality characteristics and other traits, with a group leader, a reporter and a recorder in each group, and the roles are rotated regularly. Design different

“hierarchical tasks” for the groups, allowing the groups to complete them step by step according to the characteristics of their members.

## 2. Creating Diverse Interactive Scenarios

In class, the mode of “group cooperation + whole class sharing” can be adopted to establish the interaction of “teacher-student” and “student-student”. First, let each group discuss different problem-solving ideas separately, then each group reports the ideas and other groups ask questions, and finally the teacher guides the comparison of ideas. Through communication and collision with teachers and other students, students can gain a deeper understanding of mathematical knowledge, discover the fun of mathematical exploration, thus stimulating internal learning motivation, and at the same time develop students’ ability to solve problems in this process (Sha, 2024).

After class, a “math learning buddy system” can be established, allowing students to freely form learning partners, explain one mathematical problem to each other every day, and help each other make progress. At the same time, combined with the blackboard newspaper, a mathematics blackboard newspaper with mathematical content as the theme, including mathematical history, interesting stories and so on, can be published every week, allowing students to contribute freely and expand students’ perception of mathematics.

### 4.3 Constructing a Diversified Developmental Evaluation System

#### 1. Design of Multi-dimensional Evaluation Indicators

Most regions and schools that adopt comprehensive quality evaluation currently use the six aspects in the *Notice of the Ministry of Education on Actively Promoting the Reform of the Evaluation and Examination System in Primary and Secondary Schools* as indicators, namely: students’ moral literacy, basic civic character, learning ability, cooperation and communication, sports and health, and aesthetic appreciation and expression. Although the basic aspects have been determined, there is no unified opinion on the core performance of each goal (Lv, 2019). Based on the current situation, combined with the indicators in the *Notice* and the characteristics of the mathematics discipline, four dimensions of clear evaluation criteria, namely “Knowledge Understanding”, “Cooperation Ability”, “Thinking Development” and “Learning Attitude”, can be formulated to conduct a diversified evaluation of students:

- (1) “Knowledge Understanding” – whether students can accurately elaborate the essence of mathematical concepts, such as “What is the essence of plane vectors?”
- (2) “Cooperation Ability” – whether students actively participate in group discussions and other tasks, and can listen effectively and respond to the viewpoints of group members.
- (3) “Thinking Development” – whether students have the ability to transfer mathematical knowledge and draw inferences about other cases from one instance.
- (4) “Learning Attitude” – whether students actively and proactively complete mathematics learning tasks (including pre-class preview, in-class learning and after-class review).

#### 2. Diverse Evaluation Subjects and Methods

The *Opinions of the Ministry of Education on Strengthening and Improving the Comprehensive Quality Evaluation of General High School Students* issued by the Ministry of Education in 2014 marked the institutionalization of the comprehensive quality evaluation of high school students, transforming the comprehensive quality evaluation from invisible to visible. It requires teachers to carry out a variety of activities to promote students' development in combination with the actual situation of schools and regions, investigate students' various qualities by observing and analyzing their performance in activities, form evaluations based on the investigation results, and feed back the evaluation results to students in a timely manner (Xiao, 2017).

In the traditional concept, teachers are the only subject of student evaluation, but in fact, students are growing all the time, and the comprehensive quality evaluation should take such changes into account, which is difficult to be completed by teachers alone. Therefore, a complete diversified comprehensive quality evaluation should be jointly completed by the parties who have the most contact with students, namely teachers, parents, classmates and students themselves.

(1) Student self-evaluation: Students fill in the *Mathematics Learning Reflection Record Form* every week, recording gains such as "mathematical methods learned this week" and "difficulties encountered and the solving process".

(2) Peer evaluation: Use "merit badges" and "suggestion notes" for mutual evaluation within the group.

(3) Teacher evaluation: Teachers conduct process evaluation on groups and individual members based on the observation records of group task completion and classroom performance.

(4) Parent evaluation: Parents fill in the *Family Mathematics Activity Record Form* according to students' ability to apply mathematical knowledge in mathematics activities at home.

## 5. Conclusion

Through the research on class management strategies for a positive mathematics learning community, this study draws the following conclusions:

1. A positive class cultural climate is the foundation for constructing a mathematics learning community, which can stimulate students' learning motivation and sense of cooperation, and create a good psychological environment for in-depth mathematics learning.

2. A scientific class management system is the guarantee for the orderly operation of the mathematics learning community. By optimizing the group cooperative learning system and formulating community conventions, the efficient development of learning activities can be ensured.

3. A multi-dimensional interaction mechanism is the key to promoting in-depth mathematics learning. By deepening classroom interaction and expanding after-class interaction channels, it can promote the collision of ideas and the construction of knowledge among students.

4. A diversified developmental evaluation system can fully reflect the learning process and provide a basis for strategy optimization.

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