

Exploration of Advanced Mathematics Classroom Teaching in the Context of Unfavorable Learning Situation

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ABSTRACT

As a common basic course for some undergraduate majors, the teaching quality of advanced mathematics will directly affect the teaching quality of subsequent basic or professional courses. In the teaching practice of advanced mathematics in some ordinary universities, there are often some unfavorable learning situations that are not conducive to teaching, including but not limited to insufficient teaching hours, large number of students, weak learning ability, and insufficient learning initiative. Weakening or eliminating the negative impact of these unfavorable learning situations on classroom teaching can directly and effectively improve the quality of classroom teaching.

Keywords: *Unfavorable learning condition, Advanced mathematics, PLEASE teaching model, Classroom teaching.*

1. INTRODUCTION

Advanced mathematics, as a common basic course in some undergraduate majors, plays a crucial role in the teaching of basic courses. Its teaching quality directly affects the learning quality of subsequent courses, and many universities attach great importance to the teaching quality of advanced mathematics. In fact, in the specific teaching practice of advanced mathematics, various learning situations that are not conducive to improving the quality of classroom teaching are often encountered, including but not limited to insufficient teaching hours, large number of students in class, weak mathematical learning ability of students, significant differences in learning ability and foundation among students, and lack of enthusiasm and initiative in learning. Weakening or eliminating the adverse effects of these unfavorable learning situations on the quality of classroom teaching is an effective way to improve the quality of classroom teaching. This article elaborates on how to weaken or even eliminate the impact of unfavorable learning conditions on the quality of classroom teaching from multiple perspectives, including adjusting

classroom teaching objectives, content, speed selection, rhythm control, content presentation, pattern design, and institutional construction.

2. CLASSROOM TEACHING OBJECTIVES

Generally speaking, the teaching objectives of advanced mathematics are determined by the talent cultivation plan, and the specific teaching objectives for each class are clearly provided by the teaching outline and teaching plan. It is necessary to adjust the classroom teaching objectives appropriately in the face of the impact of unfavorable learning conditions on teaching effectiveness, and teaching according to individual needs is the optimal teaching plan. In specific teaching practice, in order to achieve established teaching objectives and consider the impact of negative learning situations on the quality of classroom teaching, established teaching objectives can be divided into classroom teaching objectives and extracurricular teaching objectives. While ensuring the quality of classroom teaching, make full use of extracurricular learning to achieve established teaching objectives, rather than ignoring the quality of classroom teaching and insisting on

teaching according to the requirements of the teaching syllabus and teaching plan.

The setting of classroom teaching objectives in student-centered teaching is constrained by both established classroom teaching objectives and students' classroom learning abilities. In the process of setting classroom teaching objectives, under the condition that the progress of classroom teaching cannot be changed and on the basis of ensuring the quality of classroom teaching, appropriate adjustments should be made to the teaching content, teaching difficulty, and teaching methods to maximize the achievement of classroom teaching objectives, for classroom teaching objectives that have not been achieved, the teacher can achieve them through extracurricular teaching. It should be emphasized that after students complete their extracurricular learning tasks under the guidance of the teacher, there must be a learning quality inspection and confirmation process.

3. CLASSROOM TEACHING CONTENT

In order to achieve classroom teaching objectives, teachers need to determine the content of classroom teaching. Generally speaking, the teaching content of advanced mathematics is relatively fixed. Due to the unfavorable learning situation, it is difficult to successfully complete the originally established teaching content. Even if efforts are made to complete the established teaching content, the teaching quality cannot be guaranteed in this situation. In view of that, it is necessary to adjust the teaching content appropriately. Considering that students have relatively weak learning abilities and low learning efficiency, deleting some teaching content or reducing the difficulty of established teaching content is a suitable operation. Only teaching resources that are suitable for the learning situation are the best teaching resources. By deleting and modifying the original teaching content, it can make the teaching content more suitable for the current learning situation in terms of quantity, quality, and difficulty. This can effectively weaken or even eliminate the impact of unfavorable learning situations on the quality of classroom teaching, ensuring the quality of classroom teaching.

Obviously, in order to complete the established teaching content, teachers also need to use students' spare time for teaching. In fact, classroom teaching time is limited and fixed, and compared to limited classroom teaching time, students have relatively

sufficient self-study time outside of class. Considering the insufficient initiative and enthusiasm of students in self-directed learning, as well as the relatively weak ability of self-directed learning, certain external interventions are needed to ensure the quality of extracurricular learning. Among these external intervention measures, recording the grades of homework and in class tests into the total score is an effective method. It is a good idea to designate these effective measures as a standardized management system for extracurricular student self-directed learning.

4. CLASSROOM TEACHING SPEED

The speed of classroom teaching is a key factor affecting the quality of classroom teaching, and it is also the most difficult teaching element for teachers to grasp. Generally speaking, the speed of classroom teaching is limited by both the teaching progress and the teaching content. In order to ensure the quality of classroom teaching, the optimal classroom teaching speed is the student's classroom learning speed. In specific teaching practices, students often lag behind the teacher's classroom teaching speed in terms of learning speed. When the learning speed of students is lower than the teaching speed of the teacher, it will make the classroom teaching lose its sense of breathing. In this situation, both the teacher and the students will feel pressure and easily tire during the teaching process. At the same time, the suppressed classroom teaching atmosphere will breed and spread, and this situation will directly lead to a sharp decline in the quality of classroom teaching. When there is a scene of the teacher repeatedly explaining a certain knowledge point during the teaching process, it is mostly because the teacher's teaching speed is faster than the student's learning speed.

Considering the impact of unfavorable learning conditions on teaching quality, it is particularly important to regulate teaching speed on the basis of lowering teaching objectives and adjusting teaching content. Considering that students have a relatively slow learning speed, poor understanding of knowledge, methods, or skills, long thinking time required to apply knowledge, methods, and skills to solve specific problems, and insufficient proficiency in the basic knowledge that needs to be mastered, combined with the characteristics of advanced mathematics knowledge structure, in the classroom teaching process, teachers often need to explain the knowledge points that need to be taught

from more perspectives or use simpler examples. Sometimes, they also need to explain some knowledge, methods, and skills that should have been mastered proficiently to ensure the quality of classroom teaching. It can be seen that the unfavorable learning situation greatly increases the difficulty of controlling the speed of classroom teaching. In order to effectively solve this problem, teachers can make pre class preview materials of the knowledge points that should be mastered in classroom teaching, and attach a small test to check the learning effect, to ensure the smooth progress of classroom teaching and achieve the expected results.

5. CLASSROOM TEACHING RHYTHM

According to the assumption of unfavorable learning situations in this article, students have relatively weak learning enthusiasm, insufficient initiative, short duration of focus on learning, lack of confidence in learning advanced mathematics, and relatively weak understanding and calculation abilities. These unfavorable factors will seriously affect the quality of classroom teaching. Perfect classroom teaching rhythm can effectively weaken or even eliminate the negative impact of unfavorable learning conditions on the quality of classroom teaching. As mentioned earlier, in order to cope with the impact of unfavorable learning conditions on classroom teaching, some measures have been taken, such as adjusting teaching objectives and content appropriately, adjusting classroom teaching speed in a timely manner during the teaching process, and keeping it consistent with the learning speed of students. This kind of classroom teaching quality can successfully complete teaching tasks. If teachers can perfectly grasp the pace of classroom teaching, they can better weaken or even eliminate the adverse impact of the learning environment on the quality of classroom teaching.

Classroom teaching is an art, and rhythm is the soul of all art. If the teacher can skillfully control the rhythm of classroom teaching, the effectiveness of classroom teaching will be completely different. The perfect pace of classroom teaching is the soul of classroom teaching. When classroom teaching has a soul, the entire classroom comes to life. The unique rhythm beauty of classroom teaching will make the entire teaching look so unique. Teachers and students unconsciously immerse themselves in the ocean of knowledge, and students are no longer passively receiving education, but actively and

actively exploring new knowledge with teachers. There is not only scientific knowledge interaction between teachers and students, but also spiritual communication, which is one of the reasons why education is called art.

The pace of classroom teaching is a key factor affecting the quality of classroom teaching. From the perspective of classroom teaching, the main factors that affect the pace of classroom teaching include content arrangement, time allocation, and language design. The arrangement of teaching content mainly refers to the amount, difficulty, and order of teaching content. Scientifically arranging the amount and difficulty of teaching content based on teaching objectives and students' learning abilities, and arranging the teaching sequence according to the inherent logic of the teaching content itself, is the foundation for the smooth progress of classroom teaching. Allocate teaching time based on the difficulty and importance of the teaching content. Proper time allocation can allow both teachers and students to feel that the entire process of classroom teaching is very smooth, with prominent points, alternating difficulties and easy, and differences in speed. Content arrangement and time allocation give classroom teaching a basic rhythm, and language can perfectly present this rhythm. The beauty of classroom teaching rhythm is endowed by the language of classroom teaching, because language expression is an art. Language expression is a fundamental skill for teachers to carry out teaching activities. When teachers combine their unique personal charm and use appropriate tone, intonation, and rhythm to express teaching content clearly, concisely, accurately, and easy to understand, the pace of classroom teaching is beautiful, concise, harmonious, and full of charm. This is the teaching rhythm the teachers want.

6. PRESENTATION METHOD OF TEACHING CONTENT

The presentation method of teaching content is a direct factor that affects the quality of classroom teaching. The characteristics of the teaching content of advanced mathematics are mainly reflected in its high abstraction, rigorous logic, and wide applicability. According to the assumption of unfavorable learning situations in this article, the teaching organizational form of advanced mathematics is classroom teaching, with a relatively large number of students, students lack confidence in learning advanced mathematics, and their understanding and computational abilities are

relatively poor, and their enthusiasm and initiative for learning are relatively weak. Based on the corresponding adjustments and optimizations made to the teaching objectives, content, speed, and pace, in order to more effectively weaken or even eliminate the adverse effects of the aforementioned learning situation on the quality of classroom teaching, the presentation of teaching content should have the ability to concretize abstract concepts according to the characteristics of advanced mathematics teaching content. Some concepts in advanced mathematics are very abstract, and it is the abstract nature of teaching content that hinders some students from successfully completing their learning of advanced mathematics. At the same time, insufficient and thorough understanding of concepts will directly affect their future learning and application of knowledge.

Presenting teaching content in an algebraic way has a rigorous logic, while presenting teaching content in a geometric way is more intuitive and specific. Relatively speaking, presenting teaching content in a geometric is easier to accept and understand. Let's take teaching the concept of limit $\lim_{x \rightarrow +\infty} f(x) = a$ as an example to see the differences between them.

If the concept of limit $\lim_{x \rightarrow +\infty} f(x) = a$ is presented directly in an algebraic way, the specific content is " $\forall \varepsilon > 0, \exists X > 0$, When $x > X$, there is always $|f(x) - a| < \varepsilon$ ", obviously, the expression of this concept is very abstract. If it is switched to a geometric presentation and turn limit $\lim_{x \rightarrow +\infty} f(x) = a$ into a flat animation, the teaching effect will be completely different. The specific content of the animation is as follows.

Select any point x on the x -axis, find the point P corresponding to x on the function graph, and then find the point y corresponding to P on the y -axis. When x moves on the x -axis, point P will move in the function graph as x moves. Correspondingly, when point P moves on the function graph, point y will move on the y -axis. This animation design allows students to visually observe the entire process of limit.

In teaching practice, it is easy to find that students can better understand the definition of limits after observing animated works of limits. Such teaching arrangements can improve the effectiveness of teaching. This example

demonstrates the impact of presenting teaching content on teaching quality. There are many examples like this, for example, in the actual situation where students lack confidence in learning advanced mathematics, when presenting teaching content, a difficult knowledge point can be broken down into several easier knowledge points, allowing students to cultivate their confidence in learning advanced mathematics while constantly experiencing the joy of being able to learn easily. There is another example, in order to better cultivate students' logical thinking ability, mathematical conclusions such as theorems, conclusions, and formulas can be presented using the logic module of "Because A, So B".

7. CLASSROOM TEACHING MODE

The classroom teaching mode, as the structural framework and activity program of classroom teaching, reflects how teachers can grasp the overall teaching activities and the internal relationships, functions, and sequences between their various elements from a macro perspective. The classroom teaching mode has strong integrity and operability.

Improving or innovating classroom teaching models to enhance the quality of classroom teaching has been a research hotspot in recent years. These classroom teaching modes include creative classroom teaching mode[1], flipped classroom teaching mode based on micro lessons and MOOCs[2][3], split classroom teaching mode[4][5], and various mixed classroom teaching modes[6][7]. So far, these classroom teaching modes mentioned above have been extensively studied and have their own applicable scenarios, characteristics, advantages, and disadvantages. Through simple comparative research, it can be found that none of the classroom teaching modes mentioned above are suitable for the teaching scenario set in this article. In fact, the creative classroom teaching model requires students to have very strong learning and innovation abilities, which is inconsistent with the unfavorable learning situation assumption in this article, which assumes that students have weak learning abilities. The flipped classroom teaching model based on micro lessons and MOOCs requires students to have strong autonomy in learning, which is inconsistent with the assumption in this article that students have weak learning initiative. Considering the insufficient enthusiasm and initiative of students in learning, it is difficult to ensure the teaching efficiency of using the split

classroom teaching model. In addition, various blended classroom teaching models have been studied extensively, all of which have their own characteristics. After careful analysis, it was found that these teaching models cannot well match the assumption of unfavorable learning conditions in this article, this is because they have not designed corresponding teaching reform measures to reduce or resolve the negative impact of unfavorable learning conditions on classroom teaching. From the above analysis, it can be seen that finding a suitable classroom teaching mode to ensure the quality of classroom teaching is a very important task in response to the unfavorable learning situation assumed in this article.

Fortunately, the PLEASE classroom teaching model is the one the teachers are looking for. The specific design of the PLEASE classroom teaching mode is as follows. In the specific design of the PLEASE classroom teaching mode, the teacher divides the teaching content into several teaching projects based on the teaching outline. Each teaching project's teaching framework includes four teaching modules, which are preparation, practice, summary, and extension, the practical module in which is further divided into three sub modules, namely lecture, exercise, and achieve success. Simply put, the PLEASE classroom teaching model consists of six actions, namely preparation, lecture, exercise, achieve success, summary, and extension [8], this is the origin of the name PLEASE classroom teaching mode. In addition, in the PLEASE classroom teaching mode, a classroom learning record sheet is also designed, with each classroom teaching project corresponding to a classroom teaching record sheet. The content includes the knowledge points, methods, and skills that must be mastered in the preparation stage, the knowledge points, methods, and skills to be learned in the lecture stage, the exercise questions to be completed in the exercise stage, the self-completed test questions in the achieve success stage, the self-summarized content to be completed in the summary stage, and the questions that can be attempted to be completed in the extension stage. It is obvious that this classroom learning record sheet is very useful for improving the quality of classroom teaching.

Next, let's analyze why the PLEASE classroom teaching model is very suitable for the hypothesis of unfavorable learning situations in this article. Due to the division of teaching content into individual teaching projects in the PLEASE classroom teaching model, each teaching project

has a corresponding classroom learning record sheet. As long as the prepared content in the classroom learning record sheet includes the knowledge points, methods, and skills that must be mastered for learning this project, it can effectively reduce or eliminate the adverse situation of students lacking mastery of these contents. In the teaching practice stage, as long as the recording process of students' classroom learning records is continuously checked, it is easy to grasp their learning situation and provide personalized guidance to them. This design can effectively reduce or eliminate the adverse effects of insufficient learning ability and weak learning initiative on teaching quality; by carefully examining the self-test performance of students in the successful stage, it is easy to grasp their academic performance and make timely adjustments based on their test scores, this design can effectively improve the quality of classroom teaching; by carefully examining the self-test performance of students in the successful stage, it is easy to grasp their academic performance and make timely adjustments based on their test scores. This design can effectively improve the quality of classroom teaching. From the design of the PLEASE classroom teaching model, it can be seen that it contains a complete classroom teaching framework. The design of this teaching framework itself is a kind of classroom teaching rhythm, under this classroom teaching framework, teachers can easily grasp the teaching rhythm, easily control the teaching speed, and freely present teaching content. When all the situations mentioned above can be achieved, it is easy to form a good classroom teaching atmosphere.

8. CLASSROOM TEACHING MANAGEMENT SYSTEM

The level of classroom teaching management is a direct factor that affects the quality of teaching. However, unfortunately, many teachers have overlooked this point, or in other words, many teachers have not given sufficient attention to it. The assumption of unfavorable learning situations in this article makes classroom teaching management more important. When students lack enthusiasm for learning, the classroom teaching atmosphere may appear dull; when there are a large number of students, the classroom teaching environment appears noisy; when students lack confidence, the classroom teaching atmosphere appears to lack vitality and energy; when there is a significant gap in learning outcomes, the teaching pace will be disrupted and the teaching speed

cannot be controlled. The above discussion has highlighted the importance of classroom teaching management system. In teaching practice, establishing a classroom teaching management system suitable for one's own teaching class requires different improvements in practice.

9. CONCLUSION

This article focuses on the learning situations that are often encountered in classroom teaching practice that are not conducive to improving the quality of classroom teaching, including but not limited to insufficient teaching hours, large number of students in class, weak mathematical learning ability of students, large gap in learning ability among students, and lack of enthusiasm and initiative in learning. Based on the teaching of advanced mathematics, this article elaborates on how to weaken or even eliminate the impact of these unfavorable learning conditions on the quality of classroom teaching from multiple perspectives, such as adjusting classroom teaching goals, content adjustment, speed selection, rhythm control, content presentation, pattern design, and institutional construction.

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