



Team Teaching of Higher Mathematics

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"Discussion-based" teaching; Higher Mathematics; "Participatory" teaching; Team teaching

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ABSTRACT

In view of the current drawbacks of traditional teaching, it is necessary to use a cooperative-based teaching - Team teaching effectively. This paper introduces the necessity and practical significance for Team teaching research in Higher Mathematics courses; discusses its connotation, focuses on the "Discussion-based" and "Participatory" teaching methods. Practice has proved that Team teaching of Higher Mathematics (TTHM) has achieved good teaching effects.

Introduction

With globalization increasingly in the 21st century, it is a very important choice to learn how to cooperate with each other in order to replace the past destructive competition for people. Professor David W. J. and Roger T. J., the American scholar, ever said: "No matter how comprehensive the personal knowledge and skills are, efficiency will not get real promotion if people do not reach their common goals through cooperation."^[1] This means that the coordinated effort for the consistent goal can often create a better performance. At present, cooperative-based teaching is becoming widely spread and being expected to cultivate more comprehensive talents to service in the field of higher education. Higher Mathematics is professional basic course in management, medicine and some other majors, and plays a decisive role in improving the students' mathematical quality and professional level in many universities. According to several opinions on improving the quality of higher education comprehensively, in which the ministry of education announces that "Setting up the scientific development view of higher education, taking the path of the connotation type development which takes the quality increasing as the core", we carry out teaching reform based on our own actual situation and training target of high quality and applied talents in University of Ji'nan. School of Mathematical Sciences has conducted a beneficial exploration and practice of TTHM since September 2012.

The Connotation of TTHM

Heping Xie^[2], President of Sichuan University once said: "In order to cultivate the students' critical thinking, we need transform from the past traditional force-feeding education into a heuristic teaching, critical discussion and nonstandard answer examinations and create an elite education with a small classroom in colleges and universities." Yanjun Sun, Xiaodong Lu in Beijing University also emphasized in reference [3]: "Now the radical problem need to be solved is how to realize the reform in the way of teachers' teaching and students' learning. Comprehensive cooperative teaching is an effective weapon to realize the teaching reform."

The so-called TTHM is the new teaching mode. All key elements of the teaching process teaching process and teaching environment are always in a state of coordination and balance with the basis of the theory of synergy in Higher Mathematics teaching activities. At the same time, it will improve the self-organizing ability of teaching system, coordinate the relationship among the elements of teaching system and establish the teaching system of self-regulation mechanism. As a result, forming the overall structure of the

new order and the best overall function, and then prompting coordinated development of knowledge and ability of students and improve the comprehensive quality of students.

School of Mathematical Sciences construct characteristic of Higher Mathematics course teaching mode by rounding the target of cultivating high quality applied talents, renewing education ideas, optimizing the Higher Mathematics teaching contents, innovating the teaching methods, changing the past state of classroom teaching characterized by knowledge infusion, carrying out discussion-based, participatory teaching method, and reforming curriculum evaluation method with small class teaching.

Methods Adopted in TTHM

● "Discussion-based" Teaching Method

The key element in evaluating teaching methods is reasonable or not is that whether it has reflect the teaching thought of "dominated by teachers, teaching with students as the center, with learning as the center, result of learning as the center" in the process of the implementation of the teaching method. Teachers can guide and help students thinking exploration activities consciously with "discussion-based" teaching method. If students have different views and opinions on certain issues, then discussion can form a strong external stimulation that give rise to students' interests and attention and then produce independence, exploratory and collaborative learning. The teaching method is undoubtedly the reflection of the teaching thought, namely, "dominated by teachers, teaching with students as the center, with learning as the center, result of learning as the center".

"Discussion-based" teaching method emphasizes that teachers inspire the students to express their opinions toward specific problems and then cultivate the students' ability of independent thinking and innovation through the in advance design and organization under the guidance of teachers. "Discussion-based" teaching method general include: design problems, provide information, and enlightening ideas and draw conclusions. The discussion topic should be designed to make the students understand the establishment of the new definition use the "known" to know "unknown", and proof is based on "known" studying the "unknown". The solution of the sample is how to use "known" to solve the "unknown". We can cultivate students' ability through "known" to find "unknown", study "unknown" and solve "unknown" and then cultivate their ability to solve problems and the ability to continue to learn. Finally they can achieve lifelong benefit^[4].

● "Participatory" Teaching Method

"Participatory" teaching method is a teaching organization form emphasizing the students' main body status under the guidance of "Take the student as the main body, activity as the form, the teachers and students participate activities together" in the teaching process. The teachers and students work together to combine study and discussion, and give full play to the role of the students as the theme. This teaching method is aim to fully mobilize students' learning initiative, enthusiasm and initiative and encourage students to explore by cultivating students' innovation consciousness and innovation ability.

In "participatory" teaching method, we put emphasis on information technology and curriculum integration, the combination of traditional teaching methods and modern technology teaching method, the connection the blackboard and multimedia courseware. For example, when teaching the part of function curve drawing, we teach students the MATLAB program and guide the students to draw 3rd curve or surface, etc. We stimulate students' enthusiasm and initiative fully by combining classroom teaching and guidance of students' autonomous learning.

It is very important for teachers in the classroom to carry out the "participatory" teaching method and the effective interaction between teachers and students. So how can we let more students to participate in the study? The following is the application of "participatory" teaching method in Higher Mathematics course:

(1) Teachers set situation. Teachers create a happy learning environment and mobilize students' learning initiative to make students actively participate in learning consciously. In the process of teaching, in addition to the introduction of living examples explain, sometimes we need extended topic. We use the form of group discussion, the literature and a written report to expand students' knowledge and cultivate students' ability of autonomous learning.

(2) Teachers cultivate the students' problem consciousness, and stimulate students' interest in learning consciously at the time of questions based on the students' thinking activity. In the "participatory" teaching, the teachers focus on the elaborate design of cooperative learning and clear requirements that students involve in the study. In the teaching process, we can pay attention to change the way of asking questions so that stimulating study enthusiasm. It improves the expression ability of students who dare not speak, and cultivates students' good habits of exchanges and cooperation.

(3) At the time of a lecture, teachers encourage students to propose differences. Evaluate their view in a positive aspect and create a better learning atmosphere to make students actively participate in and have the courage to explore. In the class, if the teachers dominate the class, they can neither cultivate students' creative thinking, nor impedes the development of students' creative thinking. The key to develop the students' ability of questioning mind is to change the traditional teaching way and transform the students from passive into active.

Practice Findings and Analysis

In the present study, random sampling technique was adopted to select a sample of 300 students of 2012 Chinese-foreign cooperation freshman in the University of Jinan.

Practice shows that TTHM got the full affirmation from the students in Chinese-foreign cooperation and peer recognition. Students wrote in Email: "For me, the way you use is unexpectedly, I am respected in your class. I am growing, and able to work on my own. I've always wanted to think independently. I think you regard me as a person with true feeling and needs, and as an independent individual. From now, I feel more energetic and more interested in Higher Mathematics".

Just as Shuifa Han, a professor at the philosophy department of Peking University once said: "In the classroom, teachers and students have completely equal status. They make full discussion, including question, difficult, analysis and critique. In such courses, teachers' academic activities and teaching combine directly, and students analyze and criticize the both knowledge and opinion, then know how to find problems and get the way to solve the problem through the way of teaching and learning. The students understand how to acquire the new knowledge and how to create it, or create new knowledge directly." Ransom Carl Rogers, as representative of humanistic psychology in U.S., in his essay "my thoughts over teaching and learning" in 1952, mentioned: "I feel finally that only learning that can have a meaningful impact on behavior is personal found and putting it into existent knowledge. The knowledge from the self discovery cannot directly transfer to others". Perhaps this is the real reason that Team teaching has been fully affirmed and highly recognized by students.

Conclusion and Discussion

Team teaching is a kind of teaching mode which emphasizes every factor of coordinated cooperation and gives full play to each member of the organization's positive initiative. It highlights the "leading" role of teachers and "main body" role of students in teaching process, improves the consciousness of the students' active learning and independent thinking, and stimulates students' interest in learning. Practice has proved that TTHM has received good effects. If more teachers take Team teaching in more courses, teaching effect will be better.

Whether TTHM can achieve actual effect or not, the key is in the change of teacher's teaching philosophy and teaching methods. Therefore TTHM also brings about great challenges, puts forward the new requirements about epistemology and comprehensive quality to teachers. Teachers adopting TTHM should increase their abilities through effective training and need some other support. This is a systematic engineering which needs further research, implement and practice.

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