

Research on the Teaching of Reasoning Thinking in Higher Mathematics

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Abstract: Based on the Framework of “Full Horizons and Multi Dimensions”, We Set Up a Higher Mathematics Teaching Mode Guided by Students' Demand for Innovative Thinking Ability and Complete the Practice of Teaching Mode through “Internet +”. the Creative Thinking Ability That Students Get from the Higher Mathematics Course Includes the Thinking Ability of Argumentation, Reasoning, Beauty, Etc.

1. Introduction

As the Expression Form of Human Thinking, Mathematics Reflects People's Aggressive Will, Thorough Reasoning and the Pursuit of Perfect Realm. Logic and Intuition, Analysis and Construction, General and Individual Are the Basic Elements of Mathematics. It is the Interaction of These Opposing Forces That Constitutes the Life and Noble Value of Mathematics[1]. Today, However, the Traditional Status of Mathematics Education is in a Serious Crisis. No Matter in Primary Education or Higher Education, Mathematics Teaching Has Become Empty Problem-Solving Training. It is True That Problem-Solving Training Can Improve Students' Ability of Formal Derivation, But It Can't Really Understand Mathematical Coran,. in Fact, as Mathematics Teachers, They Always Hope to Cultivate Students with Creative Ability. in Actual Classroom Teaching, They Always Emphasize the Importance of Discovering Mathematical Principles and Creating Mathematical Methods[2]. Xu Lizhi Pointed out That “Mathematical Methodology is Mainly a Knowledge to Study and Discuss the Laws of Mathematical Development, Mathematical Thinking Methods and the Laws of Discovery, Invention and Innovation in Mathematics”,. Zheng Yuxin Said That Mathematical Methods Belong to the Scope of Thinking Research, But as a More Systematic and Comprehensive Study of Mathematical Thinking, in Addition to the Method or Mode of Thinking, the Content, Form, Quality and Process of Mathematical Thinking Should Also Be Regarded as an Important Component of Mathematical Thinking Theory[3]. Zhang Dianzhou Also Pointed out That “Mathematics is a Knowledge Composed of Specific Thinking Methods, Mathematics is Not Equal to Logic, Mathematics is Far More Than Logic. Formalization is Neither the Origin Nor the Ultimate Goal of Mathematics. the Essence of Mathematical Science is to Master Mathematical Thinking Methods, Understand the Law of Mathematical Change in the Objective World, and Use It to Understand and Transform the World,. in Spite of This, the Teaching of Mathematical Thinking and Methodology Has Been Neglected in Today's Mathematics Education. Senior Middle School Students Are Trapped in the Endless Sea of Questions under the College Entrance Examination Baton All Day Long. Even If They Enter the University, They Still Can't Break Away from the Shackles of Problem-Solving Training Mode for Quite a Long Time. They Had to Rely on the Simple Skills of Middle School to Deal with the Existing Learning Tasks, So They Met Great Challenges in the Process of Higher Mathematics Learning. in the Process of Learning Higher Mathematics, Students Have Encountered Those Difficulties, and How to Help Them Make a Smooth Transition from Primary Mathematics Learning to College Mathematics Learning.

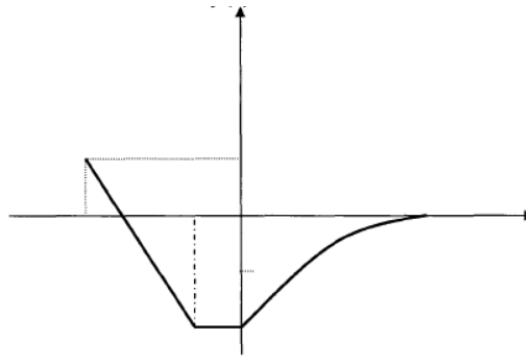


Fig.1 Image of Function $f(x)$

2. Analyze the Current Situation of Higher Mathematics Teaching from the Perspective of Students' Needs

2.1 Analysis of the Current Situation of Higher Mathematics Syllabus

Higher mathematics is almost indispensable in the training plan of various specialties in Colleges and universities. Higher mathematics affects students of different majors with its irreplaceable charm. However, different majors have different needs for higher mathematics, so the outline of higher mathematics should be different. However, in the process of making the syllabus, the higher mathematics led by teachers can provide students with some ability considerations, while ignoring the different needs of students of different majors for higher mathematics[4]. As a result, the syllabus of Higher Mathematics for different majors is only a chapter addition, with a slight difference in content depth and breadth. According to the existing syllabus, students of different majors can only passively acquire the same basic knowledge and skills from the higher mathematics curriculum, which is contrary to the goal of credit system to encourage students' personalized development and cultivate students' innovative thinking ability.

2.2 Analysis of the Basic Situation of Higher Mathematics Teaching

Teachers are not aware of the cultivation of students' creative thinking ability. In the process of knowledge teaching, the transition emphasizes the teaching of knowledge and skills, neglecting the ability training. In the teaching process of higher mathematics, teachers are too "self", and the teaching method used in class is generally "giving", rather than "giving + satisfying"[5]. This is due to the fact that teachers neglect the needs of students of different majors for different abilities in mathematics. Because students have different majors, they must want to obtain some similar or completely different needs from higher mathematics, and then meet the students' desire to improve their innovation ability. What are the needs that students need from higher mathematics, whether they can meet them in the teaching process, or how they can meet them? Teachers lack sufficient research on these problems. As a result, teachers focus on the display of teaching materials in the teaching implementation stage. Although teachers use advanced teaching methods, teaching media and teaching ideas in teaching, the whole teaching process only focuses on the supply of teachers to students because of ignoring the demand factors of students[6]. Because this kind of "self" teaching idea runs through the whole teaching process, it is naturally thought that this is the only demand that students want to obtain from higher mathematics. Some teachers also pay attention to the multi-dimensional needs of students in the process of teaching design, but how to integrate the needs of students into the teaching process, lack of sufficient research. Finally, it leads to the absence of the value of higher mathematics, which makes students gradually "fear the collapse" of higher mathematics.

Table 1 Level of Mathematical Concept Construction

Level stage		Concrete performance
Operation phase		Individual's transformation of perceived objects under external stimulation
Process stage		Individuals form a kind of psychological construction in repeated operations, which is no longer limited to specific operations
Object stage		The individual can coordinate the process or form reversible process, that is to say, treat the process as a whole
Schema phase	Single schema	Only pay attention to discrete operations, processes and objects, and put aside other knowledge points with similar properties
	Multiple schemas	Pay attention to the connection between various formulas
	Schema transfer	Connect the knowledge points

2.3 In the Process of Higher Mathematics Teaching, the Motivation of Students' Demand is Weak

Students are full of awe when they study advanced mathematics. Surrounded by awe, mathematics teachers are full of admiration. It is precisely these emotions that bind the students' thoughts, make the students lack of thinking about the motivation of learning higher mathematics and the influence on the value of higher mathematics, which leads to the students have little motivation to express their needs actively. Even if some students have thought about which abilities should be obtained from higher mathematics, they will eventually “die” because the channels to express such needs are not smooth enough. It should be said that with the progress of science and technology, the living and learning environment of students is changing with each passing day, and the channels of expressing emotions are also diversified online and offline[7]. But students think that the demand for higher mathematics should be the product of “understanding + intelligence”, so the channel to express this demand should be serious. But the reality is that it is difficult for students to find teachers in time and communicate face to face, which leads to the weakening of this demand.

3. Constructing Higher Mathematics Teaching Mode from the Perspective of Students' Needs

3.1 In the Teaching Preparation Stage, It is Necessary to Open Up a Wide Range of Ways and Establish Communication Channels between Teachers and Students

The main goal of credit system is to encourage students' individualized development and cultivate innovative thinking ability, so listening to students' needs for courses is an important foundation to achieve this goal. Secondly, to establish a channel for students to express their needs and respect students' needs for the curriculum is the power source for teachers to improve their teaching level, and also can improve teachers' awareness of fully integrating into the design of teaching content guided by students' needs in the teaching preparation stage[8]. Students' Forum and Internet tools are effective channels for communication between teachers and students. If a channel is established, it is necessary to talk widely. First of all, the group communication method is adopted. At this time, the students' demand for innovation ability is a shallow understanding after careful consideration of the higher mathematics curriculum. Secondly, through group communication, we can find out the students who dare to think and can think, and then we can hold teaching symposiums in groups. In this case, compared with the results of group communication, the acquired information of students' needs has certain “professionalism” and “depth”, which has more profound implications for teachers. Finally, the teachers use the “point-to-point” approach to discuss teaching. On the basis of hierarchical grouping, it aims to convene individual students for communication, and the demand information obtained is the most representative, which is exactly what teachers need. Through the establishment of this kind of extensive grouping, hierarchical grouping and targeted communication channel, teachers can understand the needs of students in time and prepare for teaching design.

3.2 Cultivate Students' Motivation to Think about Needs

The teaching mode of credit system requires students to put forward the demand direction of ability in combination with their own personality development[9]. Combined with their own development needs, students' demands for the curriculum are the necessary prerequisite for the realization of personalized development. Therefore, it is the premise for students to have a deep understanding of the innovative ideas of higher mathematics to stimulate students' thinking motivation of putting forward some aspects of needs to higher mathematics. The effective way to stimulate this motivation is “the combination of Ideological and political education and research”. First of all, through the ideological and political education of the curriculum, students can have the ideological and dynamic basis of hard study, and can also inject the power of model for students. Driven by the power and power of role models, students can constantly consolidate their motivation for thinking. Secondly, using the combination of study and research to stimulate students to think about the demand of innovation ability. In the process of teaching, teachers combine knowledge teaching with research teaching, and constantly guide students' scientific research awareness, so that students have the ideological basis for innovative practice and application of knowledge. Finally, we should strengthen students' consciousness of active thinking with “multi-dimensional” problems, such as knowledge and skills, life problems in mathematics.

3.3 From the Perspective of Students' Demand for Three Kinds of Innovative Thinking Ability, Construct Higher Mathematics Teaching Mode

Under the credit system, students need to acquire innovative thinking ability to promote the overall and personalized development. Only when teachers take students' needs seriously can they be fully reflected in the construction of classroom teaching mode. Under the credit system, higher mathematics teaching mode can provide students with more ability training than traditional teaching mode. One is that the goal of credit system needs more discussion and preparation from teachers of higher mathematics; the other is that the goal of credit system needs students to make more clear ability development. According to the results of question and answer of students who are receiving higher mathematics learning, have accepted higher mathematics learning and practice applied higher mathematics, what students hope to obtain from teaching is not only the promotion of conventional knowledge and skills, nor just the appreciation of teachers' elegant teaching performance, but also the need to acquire knowledge “behind knowledge” from textbooks and teachers. The “knowledge behind knowledge” is to improve the ability of reasoning, reasoning and aesthetic thinking. Obviously, the needs of students for these three abilities affect the ability of students to meet the needs of their own development at present and in the future, and teachers need to fully respect them.

4. Conclusion

The credit system has come to fruition in European and American colleges and universities. The practice shows that the credit system has a strong advantage in training students' various abilities and promoting the personalized development. Therefore, it needs every teacher's efforts to achieve the goal of credit system teaching. From the perspective of students' demand for curriculum, the construction of higher mathematics teaching mode through “Internet plus” is an important component of achieving the goal of credit system training. The students' demand for advanced mathematics is not limited to knowledge and tool, but also hope to obtain the promotion of various abilities. When constructing the teaching mode of higher mathematics, teachers should fully respect the needs of students for higher mathematics courses, so teachers should have a broad vision, a keen sense of smell, and a strong ambition. The construction of higher mathematics teaching mode guided by students' needs can not only meet the needs of students for the three abilities of higher mathematics, but also meet the development needs of teaching materials, teachers and students, and finally achieve the training goal of credit system.

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