Chapter 191
The Practice of Advanced Mathematics Teaching Quality Evaluation System

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Abstract To integrate the mathematical history and the idea of mathematical modeling into the teaching of mathematics timely, so that students can get deeper understanding of how to get and apply the mathematics concepts and theories to real life. In order to prove the feasibility, the advanced mathematics teaching quality evaluation system is designed. And, the effectiveness of the implementation of the advanced mathematics teaching quality evaluation system in our university is verified.

Keywords Advanced mathematics • Mathematical history • Mathematical modeling • Teaching quality evaluation system • Mathematics culture

191.1 Introduction

In recent years, mathematical modeling activities in universities are widely carried out, which creates a good environment and lots of opportunities for the training of the talent in Applied Mathematics. The mathematical modeling contests greatly prompts the deeper study of the mathematical modeling methods arouses the student’s enthusiasm in Mathematics learning and applying. Participation in mathematical modeling contest helps students to learn knowledge which they can’t get from the traditional teaching, master the method to transfer the problems in real life to mathematic model and solve them, guide students to discover their own creativity thus strengthen their self-confidence further [1, 2].

But as a foundation course, Advanced Mathematics is usually opened during the freshman year: they have lots of foundation courses which are often abstract and
difficult-to-understand, so most teachers adopt the way of “concept to the theorem, and to show examples, then exercises,” – the Spoon-feeding education way. This kind of teaching model emphasizes on the training of student’s math skills, spatial imagination, logical thinking skills, neglecting the training of their mathematical application ability and mathematical awareness, such as the ability of finding out actual mathematical problem, refining the problem, the use of mathematical language and mathematical model to describe the problem [3], using mathematical tools to solve practical problems. Under this circumstance, the students get no idea of the origin of mathematical concepts and the use of Mathematics. They learn Mathematics just because they have to learn, without any interest and enthusiasm, some of them even fear of it and dislike it. So we integrate the knowledge of Mathematics and the case study of Mathematic Modeling in our Mathematics classes, we also carry the teaching idea as the main point to design Advanced Mathematics Teaching Quality Evaluation System. The result of a two semester’s student’s questionnaire investigation verify it’s reasonable and effectiveness.

191.2 The Practical Analysis on Advanced Mathematics Teaching Quality Evaluation System

The idea of mathematical modeling integrated into the teaching of advanced mathematics is to hope the students learning the knowledge easily, at the same time they can know the way of thinking, understand the essence of mathematics, know the ins and outs. Furthermore, by means of this teaching methods, they would think mathematical is very useful and very practical course. In order to prove the effectiveness of the teaching methods, we design the evaluation system. After two semester’s practice, we perform a survey for 1,500 students in our university. The results are shown in Table 191.1.

It is easily to find that after the implantation of the project, the proportion of “excellent” increase significantly in the four respects list below:

Teaching materials (refer to: Mathematical modeling case, mathematics history and culture) can stimulate student interest and enthusiasm.

Teaching can combine theory with practice, focus on solving practical problems.

Various forms of assignments to promote student to master the knowledge thoroughly.

Reading report (Chapter summary and small papers, etc.) is helpful to promote student learning initiatively.

Therefore, it’s useful to invite the mathematics history and mathematical modeling case, helping the students know how the dull and boring concepts and theorems are discovered and applied, which will promote students’ interest in mathematics learning, stimulate students’ initiative to study understand math further. As we expected previously, the results demonstrate it’s objective and reasonable to integrate the mathematical history and the idea of mathematical modeling into the mathematics teaching.
Deepening the understanding and awareness of mathematical concepts and theories [4]. It is not difficult to discover from the mathematics development history that the spread of mathematics achievement always accompany with the spread of mathematical idea. Although different in forms in different countries, the essence of all the mathematical achievements is the same. So it’s necessary for the mathematics teachers to have a better
understanding of the background of the mathematician’s achievements and their way of thinking. Seeing through the appearance to perceive the essence, we can get more instructive conclusion and inspire a new spark of idea.

Getting rid of the contingency and mystery of creativity in mathematics teaching. Most teachers only teach mechanically, neglecting the development process from the appearance to essence, which usually confuses the students in the study “unfathomable” mathematics: it seems that scientists have been able to achieve great success just because of their so-called “special mind”, with God on their preference. As everyone knows, the birth of any theoretical system is a process of evolution: from the emotional to the rational perception, from immaturity to maturity. It is wise to provide them some knowledge of the branch of mathematics formation and the history of birth for basic theory and basic concepts, which is helpful for students to form a good knowledge structure and get rid of the contingency and mystery of creativity in mathematics teaching.

Stimulating students to study mathematics hard. Interest is always the best teacher, the German poet Novalis [5] said: “The mathematician is actually a mathematics addict, no fans no mathematics”. Then how to introduce the “brilliant” color into the uninterested and rigorous logical reasoning symbols? The British scientists Dampier has said: “There isn’t any story more attractive than scientific development”. There are countless people and story happening during the 5,000 years history of mathematics development, which constitute the Attractive subject in Mathematics Teaching. We select a number of famous mathematicians to present their vivid examples in study of mathematics to add the ideological education in our mathematics teaching, in order to help them understand the birth of mathematical achievements, also help them have a better understanding mathematician’s ideas, their hardships behind the success of such initiatives. By doing so, we can not only motivate students in learning mathematics imitatively, but also can promote the continuous improvement of teaching quality.

### 191.4 Necessity of Mathematical Modeling to the Advanced Mathematics Teaching

Mathematics comes from real life and has close relations with other subjects and real life. Applying mathematical knowledge to real life or setting mathematical scene, building mathematical model is a basic way to strength the relations between mathematics and real life.

Stimulating students’ interest to learn mathematics. With the introduction of mathematical models to advanced mathematics, mathematical problems can be solved quickly and correctly by using analysis, computing and logical reasoning [6]. At the same time, the models of problem to be solved can be constructed by using mathematical language and models to abstract the instinct rules of an objective that. So during the teaching, combining some relevant contents with corresponding mathematical model, interspersing some mathematical knowledge
background and mathematical modeling methods will build bridges between the boring teaching contents and the colorful outside world which will lead to multiplier effects. For instance, golden section shows how high the heels of the girls selected look more beautiful, the correctness of controlling diet and doing exercises frequently in weight loss model, the fairness of drew lots and so on. To make students recognize the practical value of learning mathematics is beyond what the traditional teaching can achieve.

Training students’ mathematical thinking skills and experiencing the practical value of mathematics. The vitality of mathematics lies in solving all kinds of problems from real life effectively. How to convert the practical problem to mathematical model is a test to the students’ abilities of solving problems creatively, which is also a important task of mathematical teaching. So mathematical modeling idea should be permeated in the process of teaching. Student should be instructed that when confronted with practical problems, they should try to find proper model in the lessons which have been taught before and then study the problems with the properties of model or problem-solving thinking. For example, the theory about the nature of continuous function on the closed interval is strong. After introducing theory, the model of the chair stability can be introduced that how to balance a chair on undulating ground. In the process of explaining derivative applications, some practical problems can be introduces such as instantaneous speed, marginal revenue and so on. In some parts of differential equation chapters, epidemic model can be inserted. Combining the SARS virus in 2003, using differential equation model can analysis the variation of the number of infected person. Thus, the applications of mathematical modeling methods to solve practical problems can make boring mathematical problems more specific, which will increase the students’ curiosity and improve students’ application of mathematical skills as well.

191.5 Summary

Putting mathematical culture and mathematical modeling to advanced mathematics teaching is effectively, which can also expose the weak-links of our school education timely. Teachers can make comparative analysis according to the results of self-evaluation and students’ assessment, which can reflect the gap between subjective efforts and objective teaching effectiveness truly. After that, teachers could adjust their knowledge structure and ability structure to improve teaching quality.

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