

Research on the examination reform of the course of numerical analysis

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Abstract

In this paper, we have carried out an examination reform of the course of numerical analysis in the face of some problems. The process assessment of the course of numerical analysis has been added. By the examination reform of the course of numerical analysis, it is obvious that students' interest in learning numerical analysis has been increased, and their ability to solve practical problems by using numerical calculation methods has been improved.

Keywords: *numerical analysis; examination reform; usual performance; unit test*

I Background and value of the examination reform of the course of numerical analysis

Examination is an important way to evaluate students' learning effect. At present, the examining method of the course of numerical analysis is generally as follows: usual performance + final examination. Usual performance includes attendance rate in class, completion of homework, etc., accounting for about 20% of the total score, final examination is generally closed-book examination, accounting for about 80% of the total score. This examination mode is relatively single, especially for the course of numerical analysis, which has a wide application value, cannot reflect the students' learning effect very well, and cannot fully reflect the students' learning effect. Some authors have discussed some ideas of reforming this course in [1]-[4]. The purpose of the course of numerical analysis is to solve practical problems. In addition, the examination paper form cannot reflect the students' mastery of the course. It is mainly reflected in the following aspects:

(1) Usual performance includes attendance rate in class, completion of homework, etc. However, the phenomenon of copying homework is obvious, and homework cannot truly reflect the students' learning situation and level. In addition, the number of students in this course is large, and it is difficult for teachers to control the attendance rate.

(2) Final examination is not enough to reflect the students' mastery of the course.

(3) Numerical analysis is a practical course. It is difficult for students to reflect their ability to solve problems in practice only by examining written papers.

In this paper, we have carried out an examination reform on the course of numerical analysis in the face of the above problems. The process assessment of the course of numerical analysis has been added.

II. Project implementation plan and achievements

Through two rounds of teaching of the course of numerical analysis, the assessment of the course generally adopts six sections: usual performance, unit test, experiment, final examination, summary paper and flip classroom. Two rounds of the course of numerical analysis teaching on different hours and different majors. The proportion of six sections has also been adjusted. The first round is the reform of numerical analysis examination on information technology and application major in 2017. The course hours are 64 hours (52 hours of lecture + 12 hours of experiment). The second round is the reform of numerical analysis examination on mathematics education major in 2018. The course hours are 48 hours (40 hours of lecture + 8 hours of experiment).

1. Specific implementation plan

(1) Usual performance

In 2017, usual performance of information technology and application major includes attendance rate in class, completion of homework, accounting for 15% of the total score. In 2018, usual performance of mathematics education major includes attendance rate in class, completion of homework and essay, accounting for 20% of the total score.

(2) Unit test

The content of learning is divided into units, each unit should be tested. Unit test enables students to digest the knowledge at any time, and use the knowledge to solve specific problems, mobilizing students' interest in learning, and facilitating the accumulation of knowledge and ability. Each unit publishes a unit test result, which is transparent through QQ group or public e-mail. Three unit tests were conducted throughout the semester. In 2017, information technology and application major conducted unit tests in the form of written tests. The average score of the three unit tests accounted for 20% of the total score. In 2018, mathematics education major conducted three unit tests using the network teaching platform, and the average score of the three unit tests accounted for 20% of the total score.

(3) Experiment

For information technology and application major, experiment test is divided into two parts. The first part is unit experiment test. Students are required to solve problems in unit knowledge points by using computer software MATLAB. Students are randomly sampled to check the completion of the experiment. Each student is randomly selected to demonstrate an experiment on the spot. With the experimental report of each experiment, the unit experiment test results are given. The second part is the comprehensive application test, which establishes a specific mathematical model according to the knowledge learned, and uses the method learned to find out the solution of the model for analysis, and writes the experiment report. The teacher gives the application test results, which account for 20% of the course results (4 textbooks are selected for experiments + 1 comprehensive training). In 2018, there are fewer experimental hours for mathematics education major, so only unit tests are carried out. Unit tests are evaluated by the combination of computer completion and experimental

reports. Application test scores account for 10% of the total scores.

(4) Final examination

Final examination takes the form of examination papers. As the traditional examination method, closed-book examination is adopted. In 2017, the final examination scores of information technology and application major accounted for 40% of the total scores, and in 2018, the final scores of mathematics education major accounted for 50% of the total scores. Final examination checks the students' mastery of the basic content and methods of the course. Compared with the previous examinations, the difficulty is reduced. Students can take the exams according to their usual accumulation of study, and do not need to spend a lot of time reviewing.

(5) Summary paper

During the end of the course, students should complete a small paper, analyze a problem of the course or write a piece of harvest (no less than 2000 words). In 2017, summary paper accounted for 5% of the total score. In 2018, summary paper is used as references in evaluating the total score.

(6) Flip classroom

In the course of class, we often use the way of flipping the classroom to let the students go to the stage to give lectures, especially for normal students. So that they can face the students to explain a problem clearly and exercise their abilities in all aspects.

The examination reform of the course of numerical analysis is not only the reform of the examination method, but also the reform of the knowledge and teaching methods of the course. It pays more attention to the combination of practical problems and the construction of algorithms in the course of ordinary lectures. It enhances the students' practical ability.

2. Achievements

(1) Through the implementation of the two-year examination reform of the course of numerical analysis, it is obvious that students' interest in learning numerical analysis has been increased, and their ability to solve practical problems by using numerical calculation methods has been improved. Students can consciously combine mathematical problems with mathematical methods. Reform is an aspect of teaching reform and a step-by-step process. In addition, the number of failing students also decreased significantly, as shown in Table1:

Table 1 The comparison before and after the reform of numerical analysis

	class	excellent	good	medium	pass	fail	average score
		90-100	80-89	70-79	60-69	60-	
After the reform of numerical analysis	information technology and application 1501	11	7	9	3	1	82
	information technology and application 1502	3	9	8	5	9	69.55
	information technology and application 1503	6	14	6	1	5	77.71
	total	20	30	23	9	15	76.22
Before the reform of numerical analysis	information technology and application 1401	4	2	5	6	14	59.87
	information technology and application 1402	2	5	12	4	7	67.58
	total	6	7	17	10	21	63.66

Seen from Table 1 above, the number of excellent students has increased significantly and

the proportion of failures has decreased through the examination reform of the course of numerical analysis.

(2) Feedback information

At the end of the semester, students will be given feedback on a course study, which will be conducted through questionnaire survey. In 2017, the paper questionnaire are done and in 2018, questionnaire has be surveyed through the network platform.

III. Deficiencies and further work

1. Deficiencies in the Reform

- (1) There is no on-line examination at the end of the term.
- (2) The number of courses is large and the operation is complicated.
- (3) There is only unit testing, and there is no in-class online testing link.

2. Further work

- (1) Adding computer test at the end of the term;
- (2) The number of reformed classes should not be too large, and small classes should be taught.
- (3) In order to improve processing study, the number of online tests are added.

References

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