Research on the Teaching Mode of Higher Mathematics in Applied Undergraduate Colleges under the Background of New Engineering

CaiHong Li[1 *], JunJie Huang[2], ZhenDuo Wang[1]

[1]School of Electronics and Information Engineering, Xi'an Siyuan University, Xi'an, Shaanxi, 710038, China

[2]Foundation Department, Xi'an Siyuan University, Xi'an, Shaanxi, 710038, China

411219668@qq.com

*corresponding author

Keywords: New Engineering; Teaching Mode; Teaching Methods

Abstract: Under the background of new engineering, based on the talent training orientation of application-oriented undergraduate colleges, this paper mainly studies how to improve the quality of students' mathematics learning and mathematics ability through the reform of teaching mode, objective and reasonable setting of courses, so as to explore a new way suitable for application-oriented undergraduate colleges to improve students' mathematics application ability and improve the comprehensive strength of mathematics teaching and research Law.

Under the background of new engineering education, as the basic courses of science, engineering, agriculture, medicine, economics and management, it is urgent to study how to teach the basic knowledge, at the same time, it can penetrate the content of engineering technology, brand the subject knowledge and methods into the students' mind, so that students can understand and master the general laws and basic analysis methods of engineering design and engineering practice Question. [1]

1. An analysis of the current situation of higher mathematics teaching in Application-oriented Universities

1.1 Current situation of learning

Under the condition that the total class hours of university mathematics courses are relatively reduced, some students' mathematics ability is relatively weak at present, which mainly has the following problems:

a. When students enter school, they have poor mathematical foundation and uneven mathematical ability.

b. With the decrease of the total number of mathematics courses, the requirements of the original teaching objectives and teaching plans are reduced.

c. The ability of combining mathematics theory with specialty, applying mathematics knowledge to explore and solve practical problems of specialty needs to be improved.

d. The current mathematics teaching can not meet all kinds of students' knowledge requirements.

"One size fits all" teaching is not conducive to some special students who are willing to take the postgraduate entrance examination and participate in the mathematics competition. [2] Instead of reducing the requirements, they need to strengthen the training of mathematics thinking.

1.2 Current teaching methods:

At present, in the teaching of advanced mathematics, some reform measures have been taken, such as classroom blackboard writing combined with multimedia courseware, MOOC teaching, corresponding mathematics experiment courses, mathematical modeling training, etc.[3] However, the teaching mode is mainly based on the Indoctrination Theory teaching, and the examination method is still the fixed theory test paper examination, which is not flexible and rigid in teaching

and achievement requirements, and does not pay enough attention to the cultivation of students' mathematics practical ability.

2. On the innovation of teaching mode

2.1 Renew the concept of teaching and redefine the key points of teaching

Teachers should change from inheriting education with the main goal of imparting knowledge to innovative education with the main goal of cultivating ability, from injecting education with the teacher as the centre to inquiry education with the combination of teacher's leading role and student's main role, from exam oriented education to applied education, from traditional teaching mode to new teaching with scientific and modern technology The way of learning, based on the reality of school-based, is constantly improved and perfected in the exploration.[4]

2.2 Reform teaching mode and evaluation mode

The lag of teaching method and evaluation method is the bottleneck of higher mathematics teaching reform and curriculum scientific development. The reform of higher mathematics curriculum should change from the "indoctrination education" mode of "concept theory examination theory" to the "Application Education" mode of "practice theory application examination application".[5] In teaching, we should boldly explore the teaching methods aiming at cultivating innovative application talents, and appropriately reduce the strictness of thinking and logic. In terms of teaching methods, through the implementation of teaching methods such as "case teaching method", "discussion cooperative teaching method", "interactive teaching method" and "task driven teaching method", and in combination with the teaching content, students are arranged to cooperate in groups in time to carry out some research-based learning and practice activities, so that students can actively participate in, practice in person, think independently, explore cooperatively, and experience problem-solving The pleasure and sense of achievement brought by it can improve students' thinking quality and ability of independent learning. [6] In the aspect of teaching evaluation, we should combine the students' performance in many aspects to give results, so that the examination can be changed from a simple test method to an important one that can cultivate students' innovation ability.

2.3 Close to professional objectives and highlight professional characteristics

The teaching system and content of higher mathematics course should follow the principle of scientificity and practicability of teaching content, focus on the goal of professional training, proceed from the actual needs of the learning of the follow-up courses of the major, according to the needs of different disciplines of the major, effectively combine the mathematical knowledge and relevant professional knowledge, highlight the application of higher mathematics course in the learning of the follow-up courses of the major The interdisciplinary study and knowledge integration make students eliminate the blind sense in learning, fully realize the basic position and important role of mathematics in the learning of professional courses, and achieve coordinated scientific development in knowledge, ability and quality.[7]

3. Innovative practice of teaching mode

To complete the innovation and reform of Higher Mathematics under the background of new engineering, As shown in Figure 1,we can start from the following points:

3.1 Research on syllabus and content

Combined with the talent training orientation and students' characteristics of the application-oriented undergraduate colleges, we should take the initiative to build an education resource system suitable for the application-oriented undergraduate colleges, such as mathematics teaching and research, mathematics guidance mode, etc. According to different majors, reasonably plan the syllabus and contents of conventional courses and public courses, reasonably allocate

teachers' resources and arrange the time periods of various courses, and realize the purpose of teaching and research.

3.2 Textbook construction

According to the needs of professional teaching, the theoretical and experimental teaching materials adapted to science and engineering and economic management should be compiled, highlighting the close connection between mathematics and other professional disciplines. The teaching materials focus on the guidance of engineering cases and solve the practical problems in professional technology.

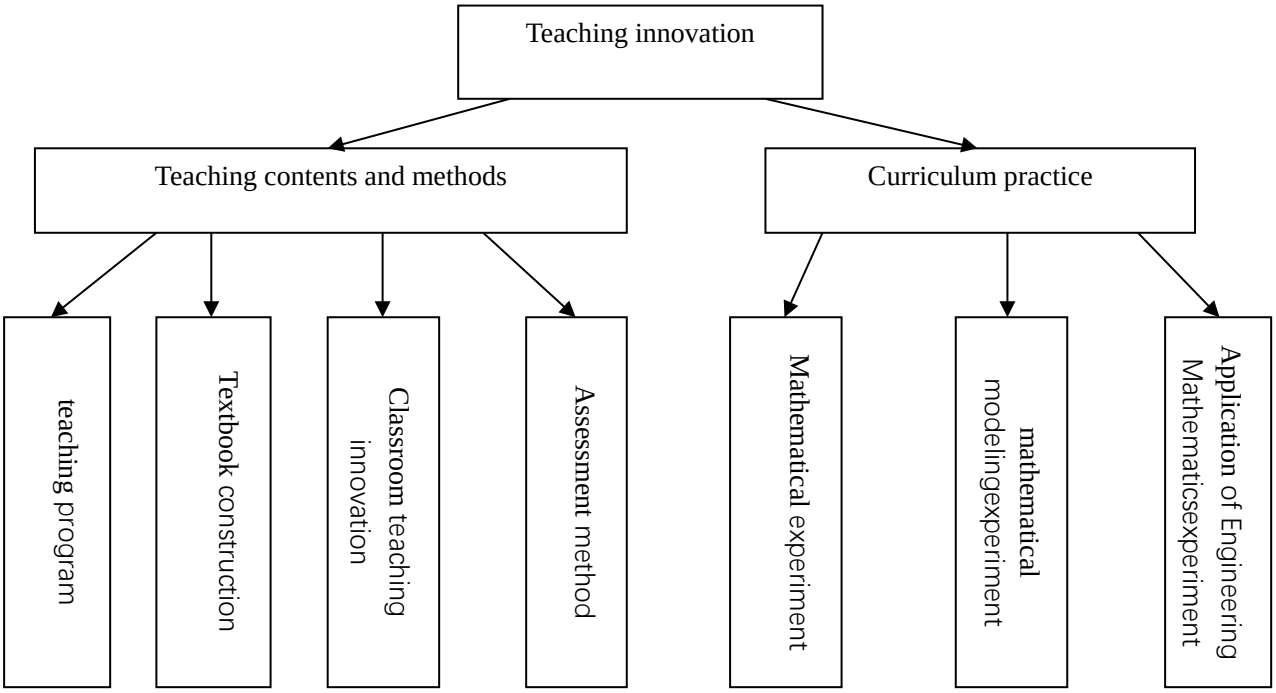

Figure 1. Teaching innovation

3.3 Classroom innovation

Carry out innovative research in teaching classroom. Build online course platform, carry out online and offline course learning, carry out online teaching and problem solving by using rain class and exchange, record micro class video, carry out task-based case teaching, put forward diversified teaching objectives and tasks for students with different foundations in classroom teaching, and divide the whole course, each chapter and each section into basic contents and improve the contents There are three levels of contents to be included and deepened. In terms of homework and tutoring, after completing the basic assignment module, students who have spare time to study will be arranged with exploratory mathematics problems and personalized assignments, and higher mathematics learning improvement class and competition tutoring class will be established to fully tap the learning potential of students and meet their personalized learning needs.[8]

3.4 Strengthen the content of mathematics experiment

As a theoretical basic course of each engineering major in application-oriented undergraduate colleges, the function of higher mathematics is more embodied in its instrumentality rather than research. How to use higher mathematics as a tool to solve problems is sometimes more important than studying its theoretical thoughts. Strengthening the training of mathematical experiment and using MATLAB to solve mathematical problems can effectively use the tool of advanced mathematics.

3.5 Strengthen the integration of mathematical modeling ideas and contents

The new curriculum system and teaching mode should be based on the principle of "enough theory, emphasis on practice and application", with the goal of quality education and knowledge application ability, and implement the technical route of strengthening the foundation, focusing on application, enhancing quality and improving ability. Mathematical modeling is a bridge connecting mathematics with practical problems, a medium widely used in various fields, and a main way to transform mathematical science and technology [9]. In the process of learning higher mathematics knowledge, through the integration of mathematical modeling teaching, students can understand the whole process of using mathematical theory and methods to analyze and solve problems, improve their awareness of Applied Mathematics, and organically combine mathematics and computer to solve practical problems.

3.6 Reform the way of assessment

Strengthen the assessment of students' learning process, change the complete test paper examination to "test paper examination + experimental examination + usual performance", and give comprehensive pass scores in the proportion of 40%, 40% and 20%. [10]Additional measures can be set up, such as taking part in mathematical modeling competitions or other competitions to improve the scores of provincial awards, to stimulate students' initiative in innovative learning and practical thinking ability.

Summary

Under the background of new engineering, in the teaching of higher mathematics, we should pay attention to the knowledge background, adopt the problem driven method, introduce the interesting cases in combination with the major, guide the thinking of mathematical modeling, increase the content of mathematical experiments, reposition the teaching objectives and content system, plan the teaching materials, and reasonably allocate the teachers. In the process of knowledge imparting, we should integrate the thinking of dealing with engineering problems, overcome the disadvantage of overemphasizing theoretical knowledge in teaching and improve students' ability of thinking and solving problems through the bridge of combining theory with practice, so as to better cultivate talents who can meet the requirements of new engineering development.

Acknowledgements

New engineering research and practice project of Xi'an Siyuan College (17syxgk004); 13th five year plan project of Shaanxi Province (sgh18h530); school level education reform project of Xi'an Siyuan College (19sygp028); 2020 university level scientific research and innovation team "Internet of things and intelligent technology application innovation team"; 2020 university level undergraduate teaching team "digital media art core curriculum teaching team".

Reference

[1] Zhong Denghua. Connotation and action of new engineering construction [J]. Higher engineering education research, 2017 (3): 1-6

[2] Gu Peihua. New engineering and new paradigm: concept, framework and implementation path [J]. Higher engineering education research, 2017 (6): 1-13

[3] Zhu Binhai. Exploration of information-based teaching mode in Applied Undergraduate Colleges under the background of new engineering ［ J ］. Chizi, 2017 (28)

[4] Qu Guofeng. New exploration of CAI in Higher Mathematics Teaching [J]. Journal of Zhangjiakou Vocational and technical college, 2017, 30 (2): 65-66, 69

[5] Li Peigen. Why engineering is new [J]. Higher engineering education research, 2017, (4): 1-4

[6] Liu Xinqiao. Construction of new engineering, integration of industry and education and

industrial transformation and upgrading [J]. Exploration of higher vocational education, February 2018

[7] Chen Zhongmin. The teaching of advanced mathematics in the context of "Internet plus" -- Based on the exploration of [J]. education in Moore, micro class and flipped classroom, 2018 (3): 74-77.

[8] Zhou Wei. Research on teaching reform of Higher Mathematics in the context of "Internet plus" [J]. Journal of Shandong Institute of Commerce and Technology, 2018 (6): 44-47.

[9] Yu Ruiyan. Research on the influence of the application of network teaching platform on the teaching process of higher mathematics [J]. Journal of Chifeng University (NATURAL SCIENCE EDITION), 2016 (15): 14-15

[10] Cao Shuai Lei. Integrated research and practice of "teaching and doing" in Higher Mathematics Based on information technology environment [J]. Higher Vocational Education (Journal of Tianjin Vocational University), 2018, 27 (01)