

"Four New and Three High" Mathematical Modeling Course Construction

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Abstract: After years of inheritance, innovation and integration, the mathematical modeling curriculum has been reformed from the aspects of education concept, training goal, teaching system, teaching material system, course content, teaching method and learning mode. Teaching "four new" design is to organically integrate the ideological and political elements with professional characteristics into the course teaching, innovate the course content, teaching methods and evaluation methods, enhance the students' independent learning ability, and realize the integration of teaching and ideological and political education. The transformation of "three high" innovation resources into teaching: high-level design, high-quality requirements, high-level implementation, relying on high-level scientific research and innovation resources, timely transformation into teaching resources through classroom teaching, extracurricular science and innovation, school-enterprise exchanges and other ways, and focusing on cultivating students' practical ability and innovation ability.

Keywords: Eprocess Evaluation, Boppps Teaching Process, Online Experiment Platform.

1. Introduction

In February 2021, the Ministry of Education issued the Notice of the Department of Higher Education of the Ministry of Education on printing and distributing the Key Points of Work of the Department of Higher Education of the Ministry of Education in 2021. The notice pointed out that, adhere to the demonstration and drive, and promote the construction of first-class majors, first-class courses and first-class basic disciplines. With the construction of first-class courses as the starting point, the reform of curriculum system, curriculum content and education and teaching mode has been promoted. In recent years, colleges and universities at home and abroad have introduced "Internet +" into traditional classroom teaching and assessment. For example, online teaching methods such as "rain class" and "MOOC" are combined with offline teaching in traditional classrooms to build first-class courses [1-5],[9],[10]. The construction of first-class courses has not only become a hot topic in colleges and universities, but also a hot spot in the academic research field.

Curriculum construction is a comprehensive work, involving the construction of many aspects. Online and offline hybrid first-class courses pay attention to the construction of curriculum objectives in line with the requirements of talent training in the new era, and effectively invest in teaching reform teachers (teams), curriculum content with The Times, teaching and learning changes, evaluation expansion and deepening, reform is effective.

In order to make the curriculum more excellent, the teachers more powerful, the students more busy, the management more strict, and the effect more significant, every college teacher and student should work hard for the for the construction of first-class undergraduate courses to meet the requirements of the new era.

2. Teaching Problems to Be Solved

2.1. The Ideological and Political Theory of the Course Does not Reach the Height and Depth That it Should

Professional resources and the role of "ideological and political guidance" have not been fully utilized, some students have not resonated with the pride of the all-round penetration of mathematics into life brought by "mathematical modeling", and lack of motivation to devote themselves to the cause of mathematics and big data, which is not conducive to comprehensively improving the comprehensive quality of students.

Students do not pay enough attention to their own post responsibilities; they do not have a high degree of civilization and friendliness among team members; they have a weak sense of collective honor; they do not have enough reverence for rules and systems; they do not have profound concepts of rule of law and integrity; they are obviously afraid of difficulties in course tasks; they are accustomed to relying on teachers' guidance and help; and they do not have high pursuit of personal value growth. Compared with the process experience, students pay more attention to the visual results such as grades.

2.2. There are Many Difficulties in Conducting Online Experiments

How to check the effect of online learning? Offline learning does not come to the lab, how to do the experiment? How to maximize the students' experimental environment and experimental effect under the condition of limited resources?

At present, the course content lags behind The Times, and the teaching method and student evaluation design are insufficient, which is not conducive to students' understanding of the frontier knowledge of mathematical modeling development and the cultivation of independent learning ability.

2.3. The Innovative Means of Teaching are in Urgent Need of Improvement

How to explore the creative thinking to solve practical problems? How can personalized learning be guided to the highest level that students can achieve?

Students' high-level innovation in scientific research has not yet formed scale effect. There is a lack of effective scale integration, "disconnect" between teaching and scientific research. When teachers use scientific research as a case of mathematical modeling, the superior scientific research and innovation resources are not fully transformed into teaching resources, and the support for cultivating students' practical innovation and advanced ability is insufficient.

3. Four New Three High Design

3.1. "Four New" Design and Practice

Combine the characteristics of engineering colleges, adjust the content of professional courses, optimize the evaluation Settings, "Four new" teaching: practice of curriculum ideology and politics in the new era, new course content (planned to build cloud teaching materials embedded in multimedia), new teaching methods (project-based 10+35 mode), and new evaluation party (increase process evaluation score).

The implementation of the new era curriculum ideology and politics:

The standard personnel training program, specially formulated the corresponding items of ideological and political goals, combined with the thought of dialectical materialism, through the analysis of teaching cases, to explore a reasonable entry point, to cultivate dialectical thinking ability. Stimulate students' recognition of cognition, emotion and behavior. Cultivate the craftsman spirit of seeking truth and pragmatism, striving for excellence and pursuing excellence, and lead students to become high-quality talents with the responsibility of The Times.

Carry out curriculum thinking and politics in combination with the application of mathematical modeling, carry out curriculum thinking and politics in combination with experience cases, embed challenging exercises in Super Star Learning Pass, and set ideological and political task points in combination with the course objectives of each class. Explore the characteristic ideological and political elements, integrate them into the whole process of online and offline teaching, and strengthen the value leadership in knowledge dissemination. Online rain class implants ideological and political videos, learning to set up ideological and political exercises, add course discussion and reflection links. Explore the ideological and political elements contained in mathematical modeling cases, through the analysis of practical problems as the starting point, cultivate students' critical thinking ability, the organic integration of ideological and political elements with professional knowledge, accompanied by the silent ideological and political education in the teaching of professional courses. Effectively optimize the teaching and improve the ideological and political effect of the course, can better realize the coordination of explicit education and implicit education, the unity of value guidance and ability cultivation.

New course content: Innovative course content and teaching design at different levels, artificial intelligence virtual simulation experiment platform and practice platform

have been built to enrich practical teaching. The platform has four functions of teaching supervision and training. The platform is embedded in guided experiments, and teachers can supervise students' experiments in the background.

New teaching methods: emphasize "student-centered", adopt bopps teaching method, special report. Project discussion, application and innovation, to achieve the learning from the low to the high level step by step. Project discussion guides inquiry-based learning, greatly expands extracurricular learning time, and enhances learning challenges. In terms of teaching technology, the combination of offline/online, multimedia teaching and virtual simulation guided experiment is adopted. Classroom teaching adopts 10+35 mode, teachers spend 10 minutes to assign learning tasks and give guidance, and students spend 35 minutes to explore learning. In terms of teaching methods, we adopt project-based teaching, case-based teaching, behavior-oriented teaching, task-driven teaching, cooperative learning teaching, problem teaching, group discussion teaching, of course, including teaching method and conversation method. Online teaching uses rain classroom, Chinese university mooc, through the combination of online and offline teaching, highlighting the pre-class preparation, students' learning difficulties are presented in front of teachers, teachers focus on guiding and solving difficulties in offline teaching, aiming at the target. In the preview courseware released by Rain Class, students can click any page or line they don't understand. The platform automatically marks it, and teachers can see the feedback of learning before class. Take students as the center, mobilize students' enthusiasm and initiative, and set interactive links with skills to avoid students' burnout. Give full play to the leading role of teachers, and realize the synergy of ability cultivation and value leading. In online teaching, teachers move from teaching to coaching. The teacher is no longer an instructor, but an active participant in the learning process, not a sage in the pulpit, but a close friend and guide to the students.

New evaluation methods: emphasize "learning effect as the center", strengthen the process evaluation, the proportion of process evaluation increased to 70%. Process evaluation methods include team discussion, project research, report defense, etc., focusing on the development of students' learning process. Carry out students' self-reflection evaluation, combined with wiggins evaluation index, use topsis to calculate the index weight, give students' stage evaluation in real time, and evaluate the teaching effect according to students' sense of gain. The mixed teaching mode based on data analysis, which deeply integrates information technology into classroom teaching, discusses a teaching mode which provides real-time learning data and forms effective feedback for teachers by using computer-aided system, which can adapt to the learning needs of students at different levels. The redefined curriculum evaluation system, the level training of understanding and understanding application analysis and comprehensive evaluation innovation aims to cultivate students' research ability and higher-order thinking.

3.2. Integration of "Three High" System into Teaching

3.2.1. High-level Design

A modeling team has been set up, and the teachers in the team lead the integrated teaching of students' scientific research, effectively transforming their own high-level and high-level scientific research achievements into teaching

resources such as courses, textbooks and practices. Strengthen the teaching of frontier knowledge and new technology, and improve the innovation of teaching content.

Our course team encourages professors to set up professional academic frontier elective courses based on the characteristics of the subject. The teachers of the course team participate in all aspects before and after each competition [6], and the students' self-confidence is rapidly improved. Professors also lead student research teams to conduct post-game research and guide students to publish their research results.

Every year, we participate in the national mathematical modeling Annual meeting of Hubei Province, pay attention to the modeling teaching reform carried out by universities in the province, and collect learning materials for collective learning. Secondly, we pay attention to the development of new technologies, and currently use Yangtze River Rain Classroom, Chinese university mooc, and Super Star Learning Pass to explore how to apply these new technologies reasonably and efficiently with university teachers across the country.

AI experiment platform has four functions: teaching, learning, management and practice. Customized on-demand experiment, guided experiment, teacher login intelligent management of a variety of interactive ways. Students can directly conduct the experiment in the browser, the experiment interface is guided, the interface is real virtual machine environment, no cumbersome configuration anytime and anywhere online operation. After logging in to the platform as a teacher, the teacher can view the summary statistics of the current courses, experiments, and experiment reports on the platform. The page displays the course overview and the latest week's lab overview statistics chart. In the list of recently taught courses, you can view course details and go to lectures. In the Student Online Time ranking, you can see how long students on the platform have been studying. In the student learning profile, you can view the data such as the current number of students online, the number of experiments and the number of courseware learners, as well as the statistics chart of daily experiment participants in the last three months, the last month or the last week.

Relying on a large number of high-level scientific research projects and integrating students' innovative ideas, the University has guided students to more than a dozen scientific and technological innovation projects, and guided undergraduates to apply for patents and write dozens of academic papers. Every year, students participate in the National Mathematical Modeling Contest for College Students, "Huzhong Cup" Mathematical Modeling Contest, the National Mathematical Modeling Big Data Contest for College Students, and the International Mathematical Modeling Contest for College Students, etc. Extracurricular scientific and technological innovation activities of college students are an effective means to promote students' practical ability, and various discipline competitions play an important role in cultivating students' scientific and technological innovation ability. Through the guidance of participating in discipline competitions, teachers' professional ability and engineering practice level are also improved.

3.2.2. High Quality Requirements

OBE adheres to the results-oriented evaluation curriculum [7]. We use the obe evaluation system to analyze each student's mastery of course knowledge points, and carry out personalized guidance according to students' characteristics,

including group discussion, group task, teacher interview, etc. All learning process platforms can be recorded. The degree of achievement of course goals of elective students is increasing year by year. We aim to cultivate and improve students' ability to apply mathematics knowledge to solve practical problems as the main teaching purpose, and comprehensively improve students' mathematics core literacy as the goal, the curriculum construction is student-centered, results-oriented, and the pursuit of innovative development.

3.2.3. High-level Implementation

Strengthen school-enterprise exchanges, broaden students' horizons, rely on the big data platform of Tedi Company, cover every student, achieve modeling and sentiment-oriented guidance in the aspects of students' ideological guidance, professional learning, scientific and creative activities, career planning, etc., and expand the advantages of professional teacher resources and their ideological and political roles from class to extracurricular.

In the process of guiding students to carry out extracurricular scientific and technological innovation practice, teachers guide and help students to independently explore the issues of energy frontier science and technology, conceive works and realize works, which not only improves students' practical ability and innovation ability, but also imsubtly enhances students' professional pride, responsibility and sense of mission to accelerate the realization of energy science and technology self-reliance. Joint mathematical modeling extra-curricular base collaborative development, together with Teddy company successfully applied for the Ministry of Education collaborative education project "Python-based big data analysis and application curriculum mixed teaching mode exploration". The collaborative construction of industry-university-research [8] has accelerated the growth of students and cultivated their scientific spirit. The participation of professional institutions in the investigation program of educational practice activities is also the verification, extension and promotion of students' modeling knowledge.

4. Conclusion

The teaching of professional courses integrated into thought and politics has achieved certain teaching effects. By integrating moral education into mathematical modeling cases, students are guided to unify knowledge, belief and practice, forge ahead with determination and strive for excellence.

Ideological and political education is integrated into the curriculum training objectives, into the curriculum design, into the teaching methods, and into the curriculum evaluation indicators. Since the implementation of the case, remarkable results have been achieved in moral education, the quality of student training has been comprehensively improved, and a number of exemplary talent training results have been produced. Pioneer demonstration individual: students won the President's scholarship of Jiangnan University and were selected as role models of Jiangnan University. More than 80 provincial and above science and technology innovation competition awards, more than a dozen patents, dozens of academic papers published by students, independent learning ability, practical ability, innovation ability and comprehensive quality have been significantly improved, the emergence of mathematical modeling small assistant and other typical demonstration collective.

In the all-round talent training, knowledge learning, ability enhancement and quality improvement are integrated, and through the continuous revision and improvement of the student evaluation system, the integrated education of teaching, scientific research, thinking and politics is realized. Students have published dozens of articles on the results of mathematical modeling, students have applied for a number of provincial student scientific research, and it is no longer rare for students' graduation thesis to be awarded as provincial excellent bachelor's degree thesis. The awards won by students participating in the mathematical modeling contest also make students find confidence, creating a new cycle of learning, practice and research, and integrate teaching, scientific research, thinking and politics. Practice the "four new and three high", we modelers will always be on the road.

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References

- [1] YUAN Xiaoqing, Shi Yikai, Wang Wendong, Construction and Practice of National First-class Course of "Electrotechnics" [J]. Journal of Electrical and Electronic Teaching, 2021,43(3): 36-40.
- [2] Zhang Haiqing, Research on the Construction of University-Stream Curriculum under the Background of "Double First-class" [J], Journal of Inner Mongolia University of Finance and Economics, 2022,20(3):1-4.
- [3] Pan Sukun, A Study on the Construction of "First-class Major" in International Economics and Trade under the Background of "Double-First-class" -- A case study of North China University of Technology [J]. Foreign Economy and Trade, 2022,331, (1):137-140.
- [4] Li Hui, Shi Jun, Chen Yanyan, et al., Exploration and Practice of Online and Offline Hybrid First-class Curriculum Construction [J]. Computer Education, 2021,(7):183-187.
- [5] Wang Shun, Xiao Jianying, From Excellent to First-class -- Practice and Reflection on Course Construction of Biochemistry and Molecular Biology [J]. Journal of Jinzhou Medical University (Social Sciences Edition), 2021,19(2):60-63.
- [6] Lu Zheng, Zhou Ting, The Key nodes and Methods of Instructor Intervention in college students' Discipline Competition [J], China University Teaching, 2023,4,47-52.
- [7] Ye Zhiwei, Lin Shan, Liu Wei, Course Construction and Practice of Object-oriented Programming Based on OBE Concept [J]. Computer Education, 2021,(8):185-188.
- [8] Li Haidong, Integration and Innovation: A Study on the construction of Innovation and Entrepreneurship Curriculum System in Universities [J]. China University Teaching 2023, 3,42-51.