Teaching Reform of Local Applied Undergraduate Mathematical Modeling

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Abstract. Mathematical modeling is an important part of talents cultivation scheme of local application oriented Undergraduate Colleges and universities, in order to solve the increasingly prominent problems and contradictions in teaching, combined with the actual situation of applied undergraduate colleges, from the security system, the reform of teaching methods, introducing the concept of engineering education and improving the evaluation mechanism are discussed.

Introduction

In recent years, the application oriented undergraduate education has been developed rapidly, which has trained a large number of highly qualified applied talents for the society. The application type undergraduate colleges aims to cultivate applied talents, applied talents knowledge and ability structure is applied, and not academic, the talent not only with solid and broad basic knowledge, professional knowledge, comprehensive knowledge, strong expression, hands, innovation and organizational ability, but also has the continuous learning new knowledge, master new technology, the ability to track the latest science and technology development and social change. But at present, the teaching methods of the applied undergraduate courses often focus on the proof of the theorem, the derivation of the formula and the calculation of the exercises. As a result many students can skillfully solve problems, but not the mathematical knowledge, mathematical method is used to solve the practical problems in the professional. This requires our teaching reform according to the applied ability structure, re architecture theory and practice teaching system to cultivate students' innovation ability and application, to meet the needs of social development.

Mathematical modeling is to establish a mathematical model, to solve the actual problem of the process, is a pure mathematician into physicists, biologists, economists and even psychologists, and so on. Divided into three steps: building model, mathematical model, and model checking. Through the practical problems to find information, Investigation, research its inherent characteristic and inherent laws, and put forward the necessary assumptions, built up to reflect the relationship between the number of the actual problem, for the model solution, and the model is applied to practical problems[1].At the same time for students to learn mathematics knowledge, computer knowledge and other aspects of the comprehensive knowledge, applied to practical problems, a reasonable explanation according to the calculation results consistent with the actual. China Undergraduate Mathematical Contest in modeling by the Higher Education Department of the Ministry of education and the Chinese society of industrial and applied mathematics, founded in 1992, the annual session. At present, it has become the largest based academic competitions, national organization of the Ministry of education of the college students four subject race one, is the world largest Mathematical Contest in modeling. In September 2015,about 80 thousand college students from 1326 universities in 33 provinces(city, autonomous region, including Hong Kong and Macao) and Singapore signed up to participate in this competition.

Orientation of Applied Undergraduate Colleges

The higher education in our country includes two series, three levels and four types, i.e., full-time

education, to two series of education, graduate education, undergraduate education and higher vocational education, the three levels, the research university, teaching research universities, teaching university and higher vocational industry college four types. UNESCO approved the international education standard classification of higher education will be divided into two stages: the first stage is equivalent to a specialist, undergraduate and postgraduate education; the second phase is equivalent to doctoral education [2].The first stage is divided into 5A, 5B two categories, 5A class is academic theory,5B class is a practical technology type. 5A class is divided into two categories:5A1 and 5A2,5A1 is according to the requests of the discipline is divided into a professional, mainly to cultivate talented person's preparation for the study, 5A2 is in accordance with the requirements of the industry is divided into a professional, main culture from all walks of life of specialized personnel. Application oriented undergraduate institutions should be located on the 5A2 level, that is, the fundamental purpose of the application oriented undergraduate education is to cultivate a large number of local economic construction and social development, go, stay, get used to the application of talent.

From the point of view of the present situation, the application type undergraduate colleges and universities should be regional, in a large extent is in order to adapt to and promote local social and economic development of merger, established or upgraded, grassroots oriented in the front line of production applied senior specialized talents cultivation, to serve the local economic construction is the main target and the direction of development[3].Application type undergraduate colleges and universities both difference in research universities and to pay attention to the practice ability of Higher Vocational College, the goal of running a school and professional set closely linked to local economic and social development, to applied talents training objectives, to applied research direction for scientific research, benefit by learning theory and tools, analyze and solve various problems facing the industry. The location of the talent demand and industrial structure, the social characteristics and service space research, active service for the local economy, and the interactive development of local society. Therefore, application type undergraduate colleges and universities according to their own school type positioning in applied talents training, rather than scientific elite, culture has certain knowledge, ability and comprehensive quality, for production, construction, management, and service first post and adapt to the demand, with sustainable development potential of senior specialized talents.

Problems Existing in the Teaching of Mathematical Modeling

Existing in the teaching of mathematical modeling problems and contradictions have become increasingly prominent, mainly in the mathematical modeling teaching team strength is not strong, the old teaching material, mathematical modeling course opened is not wide enough, the number and strength of participating students needs to be improved.

Curriculum Setting and Lack of Appropriate Target Positioning. Application oriented undergraduate institutions to set up a mathematical modeling course are to emulate the comprehensive university, that this is an important means to narrow the gap with the high level of the university. Courses before students' interest is very strong, but because of too much used in the course of basic knowledge, hands-on practical ability requirements, with the deepening of the course students slowly feel learning difficulties, so in later weariness emotional learning. In order to improve the performance in mathematical modeling contest, intensive training of the students, but have the opportunity to participate in mathematical modeling contest students are in the minority, for participating students' learning effect but regardless of.

The idea of mathematical modeling into the mathematics courses and professional courses teaching, not just only opened the door course of "mathematical modeling", the idea of mathematical modeling into the calculus, linear algebra and space analytic geometry, probability theory and mathematical statistics, often differential equations and math major course into physics, computing science, majoring in finance related courses, et the students in the understanding of professional knowledge at the same time, the formation of the consciousness of mathematical modeling.

There is no "Mathematical Modeling" Teaching Material in the Application Oriented Universities. Teaching of mathematical modeling of the lack of a systematic, comprehensive, especially industry division of materials, existing materials about mathematical model rarely introduce modeling methods, principle part of the proportion of large, less involved in the practical engineering application, and principle and application in chapters no better convergence. The teaching materials involved in the case before and after the coherence is not strong, the students of the inertia of thinking is not conducive to the guidance of the problem. Some of the theories and technologies are out of date in practice because of the long period of the textbook compilation, and some new technologies have not been introduced. Due to the relationship between the number of hours, a lot of teachers in class to grab progress, to tell the main, interactive time is not much, the students are in a passive position, learning enthusiasm is not high. Some teaching materials are to participate in the preparation of mathematical modeling contest training, cannot apply to the application of undergraduate colleges and universities in the conventional teaching, and choose a good teaching material is particularly critical. Organization of the school teachers prepared with student's mathematics foundation and professional set of lecture notes, the introduction of case model is not too much, but we must have a strong professional targeted to solve professional problems, which can not only arouse the student's interest, but also to enable more students to participate in mathematical modeling, let the students to actively, practice, course the organic connection between the learning of mathematical modelling.

Teachers' Mathematical Modeling Level Needs to be Improved. With the increasing popularity of computer multimedia applications need a single knowledge structure of teachers cannot competency modeling. Teachers must will continue to strengthen their own business learning, broaden the knowledge, update their knowledge structure, strengthen and external exchanges and cooperation, to understand the mathematical modeling of the latest research direction, changing many formerly limited to theoretical discussion concept of education and teaching, the students' comprehensive quality improvement has become a reality.

Reform in Education

Institutional Guarantee, Establish effective mechanism for the local application oriented Undergraduate Colleges practical organization, training, competition and incentive, such as the formulation of the articles of association of Mathematical Contest in modeling, the students to participate in the training of Mathematical Contest in modeling of the implementation of the programme.",the mathematical contest in modeling incentives" and other documents, whereby the formation of with local characteristics of the undergraduate mathematical modeling of a series of activities. The establishment of mathematical modeling Association, set up school "College Mathematical Modeling", "technical writing" and other public elective courses.

Teaching Method Reform. The engineering of training objectives to further establish the status of the curriculum and the teaching goal, take lectures, seminars and so on many kinds of ways of teaching, the students are divided into groups, to the class as a teaching unit, the group practice. In teaching methods, the rational use of multimedia (such as the use of flash, video, etc.) in class presentation exposition, originally simple systematic teaching method is not conducive to stimulate students' creative thinking and cultivate students' practical ability, to carry out the heuristic, discussions, seminars and self-study and teaching methods, each kind of teaching methods have different teaching function should be can make these methods a greater proportion to introduction of the teaching process, the various methods organic combination, make each method play its proper function of teaching, reach the optimum combination of the overall.

Teachers not only to impart knowledge to students, but also to cultivate their innovative ability. Scientific and rational use of modern education technology, to achieve a variety of teaching methods of organic combination, expand the students' vision, so that the teaching effect is improved obviously. The interactive teaching between teachers and students is helpful to construct the environment of autonomous exploration, arouse the interest of students, improve the initiative and interest of learning, which is also the teaching method of teachers' initiative and students'

desire[4].Training teachers, the backbone of the team for the collective teaching, taking into account the teacher research expertise of each are not identical, mathematical modeling course is divided into a plurality of unit teaching and learning modules, different teaching unit with teachers' professional expertise combined by modular teaching.

Mathematics Software Teaching Reform. CUMCM used in many applied mathematics software, including Matlab, Mathematica, Lingo etc. Application of mathematical software for mathematical modeling essential utility. In the traditional mathematics teaching plan, many complex computational problems, such as the calculation of the determinant, solving linear equations, such as solving a differential equation, and these problems to give students speak many calculation methods and to spend large amounts of time for skills training, but if the use of mathematical software, these problems will be solved. To put time and energy on the understanding of the concepts and their practical ability training.

Teachers in the application of mathematical software to be used in order to cultivate students' ability to apply mathematical software. Appropriate increase in teaching hours, change the examination methods, increase the weight of the machine on the test results in the weight coefficient, the results will be distributed throughout the course of the study and training, focusing on the actual programming ability of students. Summarize the experience of mathematical modeling in recent years, the application is summarized in the main mathematical modeling knowledge, focuses on explaining the application of mathematical software in the optimization toolbox statistics toolbox, improve the ability of student use of computer technology and information technology.

Introducing the Concept of Engineering Education. Since 2000,the Massachusetts Institute of science and Engineering College, the Royal Swedish Academy of Sciences, Chalmers University of technology, Sweden Linkoping University a total of four founded the CDIO Engineering Education reform mode, and set up a named CDIO international cooperation organization. CDIO represents the concept, design, implementation, and operation of "doing the middle school" and "project based education and learning", focusing on the summary and abstract expression[5].According to CDIO education concept, the use of project driven teaching method, cultivating teamwork, interpersonal communication ability and innovation ability, can let the student in a solid grasp of basic knowledge at the same time, to deepen the professional skills, in mastering the basic foundation of professional knowledge, especially in action ability and skill training. The concept of CDIO education and talent training scheme combines, the Local Application-oriented Institutions to improve teaching quality to lay a solid foundation, further change in transition period teaching in the predicament, broaden the professional school caliber, highlight the advantages of application type undergraduate colleges and universities to serve the local.

Establish a Scientific and Reasonable Evaluation Mechanism. The reform of student achievement evaluation mechanism, applied undergraduate talents for social transportation. Current application type undergraduate teaching performance evaluation mechanism, most still rely on written examination achievement of the final exam, exam questions focused on reasoning and calculation, despising application problem, which leads to some students one-sided pursuit of high scores, the level of test scores exist a greater chance, while ignoring the improvement of comprehensive quality. In teaching, teachers in the course established diversified assessment of the new method, form the mathematical modeling on the performance appraisal system, truly the idea of mathematical modeling into the teaching, basic verification experiment examination, assessment of comprehensive design experiment, application innovation experiment examination, computer examination, written examination and comprehensive together as part of practical evaluation and increase investment in human and material resources.

To encourage teachers to actively participate in the training and guidance of Mathematical Contest in modeling, instructor of the second prize and above, the first division to get a priority promotion title, given certain incentives and the students mathematical contest in modeling achievement conversion for teachers' teaching and scientific research work.

Concluding Remarks

In the "on the further deepening of the reform of undergraduate teaching and comprehensively improve the quality of teaching in a number of opinions" clearly pointed out that to deepen the reform of teaching content, adhere to the knowledge, ability and quality in the coordinated development, the National Undergraduate Mathematical Contest in modeling the organizing committee director Li Da Qian academicians advocated "Mathematics Education in essence is a quality education, mathematical modeling teaching and contest is the effective way to carry out the quality education" by the Ministry of education[6].It is imperative to reform local applied undergraduate mathematical modeling. How to further optimize the course system, reform the teaching ways, training comprehensive practical ability, at the same time, can also better adapt to the needs of social development, cultivation of innovative spirit and practical ability of applied talents, emphasizing mathematical modeling thoughts, is suspends in front of us must consider and solve the practical issues.

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