Course Reform and Practice of Interchangeability and Technical Measurement Oriented to Engineering Certification

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Abstract. There is still a gap between the traditional curriculum system and teaching mode of "Interchangeability and Technical Measurement" and teaching needs of Engineering certification. In order to meet the standards of engineering certification, the course "Interchangeability and Technical Measurement" in our university have been reformed and explored to meet the needs of engineering certification. Mainly reflected in the following aspects: Comparing with the "Engineering Education Certification Standard", the training plan of "Interchangeability and Technical Measurement" was revised comprehensively, the overall level for teachers of teaching "Interchangeability and Technical Measurement" was improved, laboratory construction was strengthened, cultivating students' ability, Strengthen the coincidence of multimedia courseware and engineering professional certification.

Introduction

Exchangeability and Technical Measurement is an important basic course in the Engineering colleges\textsuperscript{[1-3]}. This course is also called the basis of tolerance and coordination or precision design and quality control. It is a necessary backbone technical basic course for mechanical, instrumentation and energy power specialties in Institutions of higher learning. It is also a basic subject closely related to the development of machinery industry. This course mainly teaches the dimension accuracy and the interchangeability of the hole axis, the shape and position accuracy and interchangeability, the surface roughness, and measurement technology and data processing in mechanical design. Students are required to master the basic concepts and systematic knowledge of this course, have the ability to select and calculate tolerances correctly, design mechanical accuracy reasonably, and lay a foundation for students to learn professional courses. The course of interchangeability and technical measurement has been set up since the birth of mechanical specialty in Colleges and universities. It is taught as an important basic course of mechanical technology, and is equipped with tolerance and technical measurement experiment practice\textsuperscript{[4-6]}.

Exchangeability and Technical Survey is not only a basic course for mechanical specialty, but also a specialized course closely related to various engineering fields. It is rooted in engineering practice, and will also serve engineering practice. As one of the specialties requiring engineering certification in the future, mechanical students of Zhengzhou university of Light Industry must study "Interchangeability and Technical Measurement". There is still a gap between the traditional curriculum system and teaching mode of "Interchangeability and Technical Measurement" and the training purpose and teaching needs of Engineering certification. In order to meet the standards of Engineering certification, the course "Interchangeability and Technical Measurement" in our university needs to be reformed and explored to meet the needs of professional engineering certification.

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Comparing with Engineering Education Accreditation Standard, the Training Plan of "Interchangeability and Technical Measurement" was Revised Comprehensively. The change brought by this accreditation standard to colleges and universities is to take students as the basis and constantly improve for the reform of Engineering education. The OBE education mode required by engineering certification requires teachers to have a clear understanding of the development level of students before educational activities, to control teaching with a fine "syllabus", and to choose teaching methods consistent with the type of teaching objectives. Therefore, it is necessary to revise the training plan and syllabus, with emphasis on the contents related to engineering practice. The deduction of theories and formulas which are not closely related to future work is weakened. For example, in the explanation of standard tolerance and basic deviation, the formula of standard tolerance and basic deviation is not explained in detail, but the understanding of the concept of standard tolerance and basic deviation is emphasized. Ask the student union to use the manual to find its value.

Optimizing Integration and Improving the Overall Level of Teachers of Exchangeability and Technical Measurement
The subject group is set up by teachers teaching "Interchangeability and Technical Measurement". The person in charge of the course group is responsible for the teaching organization, curriculum construction and management of "Interchangeability and Technical Measurement", and fully mobilizes the enthusiasm of teachers of all subject groups to participate in curriculum construction and textbook construction. Every 1 to 2 months, the staff of the research group carries out teaching discussions and exchanges teaching experience.

Establish the teaching mechanism of "passing on, helping and leading". Teachers with rich experience in education and teaching regularly listen to the lessons of young teachers, organize observation and observation, guide and improve the teaching methods and teaching effects of young teachers; young teachers regularly listen to the lessons of experienced teachers, learn the highlights of teaching methods, learn advanced multimedia teaching methods, etc., to form a "pass on, help, lead" Good teaching mechanism and environment to achieve the goal of common improvement. Regularly organize all teachers in the teaching and research department to collectively listen to and observe and comment on the teaching effect of one of the teachers in order to improve together.

Strengthening Laboratory Construction and Cultivating Students' Self-improvement Ability
Regularly adjust experimental items and contents, integrate experimental items, reduce verifiable experiments, increase design and comprehensive experiments; set up interdisciplinary experimental projects for students to choose; strive to update experimental means, increase investment in practical teaching, pay attention to the continuous innovation of teaching content. Adding advanced equipment with high precision, such as advanced coordinate measuring instrument and surface roughness measuring instrument to replace the traditional measurement method, using computer to model experimental parts, collect measurement data, and use advanced software to process. The content reflecting the latest development of mechanical discipline will be properly enriched into the teaching content.

Paying Attention to Guidance and Widening the Base of Practice Outside School
Mechanical specialty is a specialty with strong practical ability. Its function of practical teaching is to guide students to have correct professional practice cognition. During the effective hours of the course, we should adjust the practical teaching content and increase the practical content closely linked with the real enterprise products. In the course experiment, the product parts of students' experiment are closely combined with the actual products of enterprises. For example, in the experiment of
mechanical precision design, aiming at the transmission shaft and gear parts of spiral welded pipe equipment produced by an enterprise, the students can test and test the actual product parts of enterprises with real knives and guns, and carry out precision and other items. Aim Design, such innovative training improves the effect of practical teaching, so that students can really get exercise and further enhance their practical ability. In the course of practical teaching, students are encouraged to take part in the practice of engineering training centers and off-campus cooperative bases as much as possible. Students are encouraged to combine basic curriculum practice, professional comprehensive practice and social practice.

Enhancing the Conformity between Multimedia Courseware and Engineering Professional Certification

In CAI courseware, we should add more examples in engineering application to make students feel that interchangeability and technical measurement are right beside us. When it comes to the role of interchangeability in improving product efficiency, Henry Ford, known as the "father of automobiles" by Americans, took the lead in assembling automobiles by assembly line in 1913 using the interchangeability principle, and realized the myth of assembling a car in 10 seconds. As a result, the output of automobiles has been greatly increased, while the production cost has been greatly reduced. In addition, it emphasizes the integration of curriculum content and information technology, and makes use of network and multimedia technology to improve the scientific, advanced and interesting nature of teaching content. Strengthen the real-time communication between students and teachers, so that students can get the best teaching resources.

Conclusions

The curriculum reform based on engineering certification has certain positive significance for improving students' engineering literacy, which is mainly embodied in the following aspects:
(1) Students can better solve the problem of Engineering knowledge,
(2) Students are more willing to learn this course and enjoy it.

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