Research on Curriculum Reform of Mechanical Manufacturing Equipment Design Based on Engineering Awareness Training

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Abstract. Machinery Manufacturing Equipment Design is an important professional course in mechanical design, manufacturing and automation of colleges and universities. It involves a wide range of knowledge, and requires a high level of students' comprehensive ability to apply knowledge. It is practical and applicable. However, the current teaching model still has a weak engineering awareness, and students lack engineering practice ability and independent innovation ability. The study of many contents of the course still stays in the teaching of theoretical knowledge, so that the students' understanding of the course Machinery Manufacturing Equipment Design is limited to the text of the book and cannot be combined with engineering practice. Therefore, the teaching content of the course Machinery Manufacturing Equipment Design needs to be reformed, mainly to strengthen students' engineering awareness, thus strengthening students' practical ability and innovative ability, and promoting students' all-round development.

1. Introduction
Machinery Manufacturing Equipment Design is an important professional course in mechanical design, manufacturing and automation of colleges and universities. It involves metal cutting machine design, fixture design, industrial robots, logistics systems, etc. into one course [1], involving the knowledge is wide, the students' ability to comprehensively apply knowledge is high, and the practicality and application are strong. Students must possess the engineering practice ability and the innovation ability while mastering the theoretical knowledge [2]. The teaching method of the traditional Machinery Manufacturing Equipment Design course only stays on the explanation of theoretical knowledge. The students' understanding of this course can only stay in the book. If the students are allowed to practice, the students do not know how to start, which is not conducive to student's practical work. At the same time, the traditional way of teaching is based on the teacher's teaching of book knowledge. Students can only listen, but they don't have time to think. Few teachers deliberately cultivate students' engineering awareness and innovation consciousness. Therefore, the efficiency and effectiveness of the course Mechanical Manufacturing Equipment Design is not good. In recent years, the country needs a large number of technical talents, and the Machinery Manufacturing Equipment Design course is the main course of mechanical design, manufacturing and automation. It has an important role to improve the students' knowledge system, students' practical ability, the ability of analyzing and solving practical problems. It is so important to cultivate innovative and practical talents [3-5]. Therefore, how to strengthen engineering awareness has become the main goal of the curriculum.
reform of *Machinery Manufacturing Equipment Design*, in order to enhance students' engineering practice ability and innovation ability, and cultivate and improve students' engineering awareness in all aspects.

2. Problems and curriculum status in the course of *Mechanical Manufacturing Equipment Design*

2.1. The course content design is too single and formalized

The traditional *Machinery Manufacturing Equipment Design* course is mainly based on the teacher's "cramming" infusion, less interaction with students. Students has low interest in learning, and even feeling tired of learning. In the course of class, most students only listen to the teacher and take notes. They seldom have time to think by themselves, and they are only busy taking notes. Moreover, few students review the theoretical knowledge and look over the notes after class. Therefore, the course is inefficient and student’s ability has not been improved [6].

The teaching content of the traditional course also has problems. Although the textbook will be revised regularly, it is still difficult to catch up with the rapid development of machinery manufacturing equipment industry. For example, the most important content of the textbook, metal-cutting machine tool design, is still based on the traditional graded variable speed main transmission system design, and the introduction of the current widely used in the field of machine tools such as stepless variable speed, motorized spindle, parallel transmission and other knowledge is very simple, which results in a serious disconnect between book knowledge and reality [7]. The disconnection with reality leads to the knowledge students learn is backward, useless and can’t practice to life.

2.2. Unreasonable design of practical courses

In the course of *Mechanical Manufacturing Equipment Design*, teachers often only pay attention to the theoretical knowledge in textbooks, but neglect the design of practical courses. Students' understanding of the mechanical equipment is only stay in the content of the book, and the content of the book introduces equipment is obsolete, now fast development in science and technology, new processing device is introduced in the life, the students only know the book on the old equipment, and don't know the new equipment, leads to the students learned knowledge useless, cannot be linked with life. In the course of designing the course, the teacher simply explained the equipment in the textbook, but did not explain the structure, use method, technological process and standard parts selection of the equipment carefully [7, 8]. The pictures in the book are flat, which is not good for students to understand the equipment. In the long run, students will lack of practical engineering awareness, so that students in contact with real practical work, the lack of systematic, standardized engineering design thinking and creative thinking.

And more design practice course can deepen students' understanding of the equipment, the students brought before the actual equipment to give students more hands-on opportunities, not only can increase the enthusiasm of students, improve students on this course to *Mechanical Manufacturing Equipment Design* of interest, can deepen students' understanding of the machine, improve students' practical ability.

2.3. Lack of solid basic knowledge and insufficient application of comprehensive knowledge

In the course of *Mechanical Manufacturing Equipment Design*, many comprehensive knowledge points are designed, but teachers often ignore them when preparing lessons, or cannot explain this comprehensive knowledge in each knowledge point, resulting in students cannot form a knowledge system in the learning process, and there are always small blind spots. Combined with the students' autonomous learning ability is poorer, lack of learning initiative, few students take the initiative to comb the comprehensive knowledge, learning in the long term, it is easy to make students' basic knowledge not solid, there are a lot of loopholes, appeared in the process of applying knowledge rusty, the phenomenon such as copy, is not conducive to student learning mechanical manufacturing equipment design course.
A lot of data in the course need to understand the theoretical knowledge in the book and calculate relevant values by using formulas. If students do not have solid basic knowledge, they will not be able to use knowledge flexibly, and many problems will occur in the design and calculation process. Many students will copy the data in the book when calculating and proofreading data, thus wasting the opportunity of hands-on practice. The engineering drawing design learned in the course needs accurate data and involves a lot of content. If you do not pay attention to it, serious mistakes will be made and the whole engineering drawing will be wasted.

2.4. Insufficient teaching in teamwork
In the course of Mechanical Manufacturing Equipment Design, teachers often adopt an independent teaching method and treat each student as an individual, ignoring the fact that the whole class is a group. In real practical work, teamwork is the top priority of the whole work. Whether the engineering practice can be successfully completed depends on the cooperation of all the staff. Therefore, everyone needs to have a sense of teamwork and cooperation, and can help each other. This kind of independent teaching method of teachers will not be conducive to the cultivation of students' sense of teamwork, indirectly blocking the contact between students and making everyone become an independent individual. Therefore, when encountering problems, students will only think of methods that are beneficial to themselves, while ignoring the interests of the collective.

2.5. Lack of teachers' engineering background and practical experience
In recent years, young teachers have been introduced into colleges and universities to focus on their academic qualifications, degrees and even graduate schools and overseas experiences, which plays a certain role in improving the scientific research level of colleges and universities. But on the other hand, especially for engineering schools, whether teachers have engineering background and practical experience is very important, and the introduction of young teachers is often just went out of the campus of doctoral students, the experience is very lack, after induction in general also simply pre-service training, no chance and energy engineering training again [7]. As a result, the teachers themselves have almost no practical engineering practice experience, and can only lay stress on the teaching of theoretical knowledge and intentionally or unintentionally avoid the practical teaching links when they are engaged in the teaching of such courses as Mechanical Manufacturing Equipment Design. For example, in the aspects of machine tool part design, fixture design and production line design involved in the course content, teachers' understanding of the production process and equipment of manufacturing enterprises, as well as teachers' practical ability are highly required.

3. Research on teaching reform of Mechanical Manufacturing Equipment Design based on engineering consciousness

3.1. Increase the diversity and innovation of course content design
The teaching material of Mechanical Manufacturing Equipment Design course mainly centres on the design of metal cutting machine tools of traditional graded variable speed main transmission system, while the introduction of stepless variable speed, motorized spindle and parallel transmission system widely used in the field of manufacturing is very few. Therefore, it is necessary to know the latest and extensive systems and devices when designing the course, so as to ensure that students' knowledge is not outdated and can be applied in daily life. At the same time, in the process of design, we should pay attention to the basic knowledge of professional knowledge and value, and pay more attention to cultivate students the consciousness of the overall design, not only pay attention to the design of a single device, but also pay attention to the structure characteristics of equipment at the same time, using method and technological process, such as knowledge, is advantageous to the increase of the curriculum content design of the course diversity, improve the students' classroom participation and enthusiasm.
3.2. Systematic and professional course design
Because the Mechanical Manufacturing Equipment Design is a very professional course, therefore in the curriculum design should pay attention to its practical and comprehensive, want to have the system process and teaching contents in class, the teaching goal should be to develop in the direction of the professional, more conducive to students to deepen the understanding of professional knowledge, and lays the foundation for later obtain employment, ensure rigour and normative teaching content.

When designing courses, teachers can enumerate some design cases in enterprises, tell students the formal design theories and methods of enterprises, and give students a reference, which is beneficial for students to design formal schemes, make students form systematic design thinking, and more conducive to students to form engineering consciousness.

When explaining the content of engineering design, the design content should be analyzed in all aspects, such as the installation standard of the device, the installation mode of the device and the after-sales maintenance process of the device. After a comprehensive analysis, it is more conducive to students to form a systematic design thinking, and at the same time to increase students' practical ability, make course design more professional, more conducive to students' development.

3.3. Strengthen the teaching of team awareness and cooperation ability
Engineering practice is a team effort, because often many different devices are needed to complete a project, so everyone needs to work together to achieve the same goal. In this kind of collective collaborative work, even if individuals are strong, they cannot complete engineering tasks efficiently and with high quality. Therefore, students' team awareness and cooperation ability are particularly important. When designing the course Mechanical Manufacturing Equipment Design, teachers can purposefully link the single course system together, and let students fully understand the correlation between each equipment according to the actual engineering situation, so as to realize the importance of teamwork more deeply and form a strong sense of teamwork.

3.4. Course design combined with college students' mechanical innovation design competition
The mechanical innovation design competition of college students is a new platform to improve the teamwork and innovation ability of college students. The combination of course design and competition can set a goal within reach for students and enhance their learning enthusiasm. Through the competition to guide the development of students' innovative potential, in the design of teaching content, more design practice and innovative curriculum, is conducive to the development of engineering consciousness of students, to meet the national needs for innovative talents and interdisciplinary talents.

4. Conclusion
Mechanical Manufacturing Equipment Design is an important professional course of mechanical design, manufacturing and automation major in colleges and universities. Students should not only master theoretical knowledge, but also have engineering practice ability and innovation ability. However, the teaching of Mechanical Manufacturing Equipment Design still has weak engineering consciousness, including innovation consciousness, practice consciousness, competition consciousness, legal consciousness and management consciousness. The traditional teaching mode of Mechanical Manufacturing Equipment Design only stops at the explanation of theoretical knowledge, and students' understanding of this course can only stay on the books. Students lack the opportunity of engineering practice, and also lack the opportunity to think for themselves, and mostly just accept the knowledge explained by teachers. In recent years, the country needs a large number of technical talents, and the course of mechanical manufacturing equipment design is a major course to cultivate students' engineering practicality and innovation, which has received extensive attention. therefore, Only by reforming the teaching content and teaching methods of the Machinery Manufacturing Equipment Design course, can we cultivate more technical talents with engineering practice ability and innovative ability, and cultivate and improve students' engineering awareness in all aspects.
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