

Research and Practice on Teaching Reform of NC Programming and Machining Course in Application-oriented Universities

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Abstract: This paper discusses the current situation, existing problems and solutions of the teaching reform of NC Programming and Machining in application-oriented universities. Through the analysis of the characteristics and application of numerical control technology, the teaching goal of cultivating students' innovative thinking and practical ability is put forward. In view of the existing problems in current teaching, a teaching mode with "self-study before class, guidance at the end of class, learning in class, evaluation at the end of class, and warm learning after class" as the main means is put forward to optimize teaching resources and improve the reform measures of teacher training mechanism. Through practical verification, the new teaching mode and reform measures can effectively enhance students' learning interest and professional skills, promote in-depth cooperation between industry, university and research, and promote the development of CNC technology.

Keywords: Application-oriented universities; NC programming and machining; Reform in education; Practical teaching

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In recent years, with the rapid development of China's manufacturing industry, CNC technology has been widely used in various fields. However, due to the shortage of CNC talents in China, CNC programming and machining education has become an urgent problem to be solved. Therefore, application-oriented colleges and universities need to carry out reform research and practice in the teaching of NC Programming and Processing in order to meet the market demand and cultivate professional talents in line with the actual work needs

1. Clarification of teaching objectives

The main goal of NC Programming and Processing is to cultivate students' ability to master NC machining and programming technology. In order to achieve this goal, application-oriented colleges and universities need to formulate corresponding teaching objectives according to market demand and students' career development direction. When formulating teaching objectives, it is necessary to clarify teaching contents, teaching methods and evaluation standards to ensure the realization of teaching objectives.

As the core course of mechanical manufacturing specialty, NC programming and processing focuses on cultivating students' ability to analyze the NC machining process of parts, NC programming and operation, as well as the spirit of craftsmanship, innovation, safe and civilized production, analyze problems, and solve problems, etc., laying a theoretical and practical foundation for students to be competent in NC machine tool operation, NC technology and programming positions, etc. It is an important part of achieving the goal of professional talent training.

According to the analysis of the learning situation, the teaching standard of mechanical manufacturing specialty, talent training program and the curriculum standard of CNC Machine Tool Programming and Operation are integrated into the working concept of "rigorous and meticulous, ingenious craftsmanship", Determine "the process formulation method of CNC lathe/milling parts, the programming instructions of CNC lathe/milling machine, be able to correctly analyze and formulate the processing process and

compile the processing program according to the part drawings, be able to operate the CNC lathe bed to complete the processing of parts, and be able to carry out the basic maintenance and maintenance of the CNC lathe.” As the knowledge and skill teaching goal of this course, cultivate the all-round development of “morality, intelligence, physique, beauty and labor” in the new era Modern technical talents serving “Made in China 2025”, focusing on the development of students’ professional ability, learning ability, professionalism and craftsmanship as the quality training objectives of this course.

2. Reform of teaching content

Aiming at the problems of the traditional course “NC Programming and Processing”, application-oriented colleges and universities need to carry out content reform, closely combine the teaching content with market demand, and pay attention to practicality and applicability. In terms of content, in combination with the teaching content of this course, we deeply explore the professional elements related to the course content, and then imperceptibly impart safe and civilized production, craftsman spirit, innovation spirit, and excellence to students, so as to integrate knowledge teaching, ability training, and value remodeling, and implement the fundamental task of moral education.

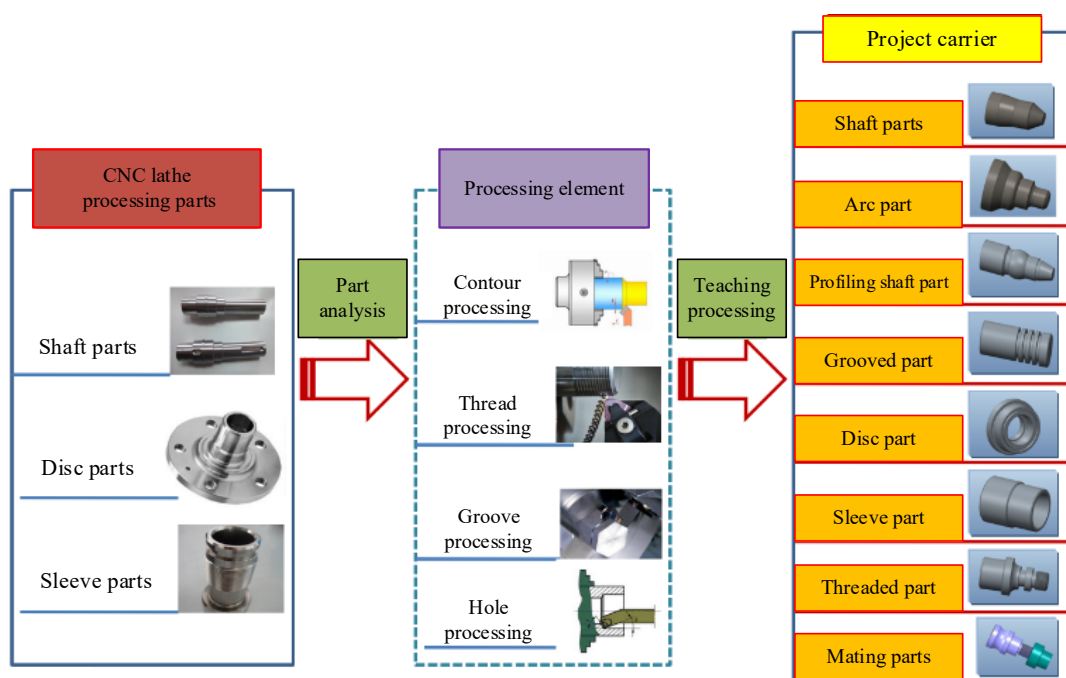


Figure 1 Breakdown of CNC parts

The teaching methods used in this class mainly include heuristic guidance, comparative analysis, group discussion, role-playing and on-site analysis. These teaching methods run through the specific teaching process. Among them, the main methods used in knowledge preparation are inspiration and guidance and comparative analysis. The case analysis method is used in the project layout stage, the group discussion method is used in the process formulation stage, the virtual simulation is used in the programming simulation stage, and the role playing method is mainly used in the trial cutting processing and detection stage.

The main teaching process of the course is based on the working process. In the learning process of the students, the student-centered teaching activities of “discovering problem-analysing problem-solving” are carried out step by step to organize and implement teaching. According to the teaching idea of “self-study before class, guidance at the end of class, learning in class, evaluation at the end of class, and learning after class”, two lines of teachers’ teaching and students’ learning are designed, and the two lines are connected by information means and applied in each link. Under the full and comprehensive support of information technology, teaching methods are reformed and teaching process is optimized, so that students are willing to participate and dare to practice.

(1) Create a situation

The first is to limit the time to sign in and cultivate the students’ spirit of contract. Then through a video of a craftsman from a big country, our craftsman from a big country completed a magic “milling” ceremony with exquisite skills. Can we complete a “milling” ceremony? Introduce the classroom teaching of this unit.

(2) Process programming

In class, each group introduced the process plan they developed, discussed in groups, compensated and corrected the introduced process

plan, raised the problems in the process, and the teacher explained the problems in the process. Each group revised the process plan.

(3) Programming simulation

The teacher will find out the weak links and explain them according to the pre-class platform test and the procedures completed before class, and then the students will revise their own procedures according to the teacher's instructions, and input the procedures into the Yulong simulation software to verify the procedures.

(4) Practical processing

On the premise of safety first and standardized operation, first use the network transmission function of CAXA digital system to transmit the program online to the CNC milling machine. Students operate the machine tool to process parts. Teachers use the CAXA video broadcast to collect it on the large screen of the integrated discussion area through the network video acquisition system, and conduct on-site teaching for all students. Display after processing.

3. Project evaluation

In order to ensure the realization of teaching quality and teaching objectives, application-oriented universities need to formulate scientific and reasonable evaluation standards. The evaluation criteria should comprehensively consider the performance of students' theoretical level, practical operation ability and innovation ability. At the same time, the evaluation standard should pay attention to the personalized evaluation and ability training of students, and encourage students to actively participate in learning and practice. Therefore, the project adopts results-based evaluation and process-based evaluation.

The integration and penetration of curriculum reform into each evaluation link are mainly reflected in the following aspects: the evaluation of craftsman spirit is permeated in the process and process inspection, and the evaluation of workpiece quality; The evaluation of safe and civilized production permeates the safety and civilized production; The evaluation of innovative spirit is permeated in the process and technology as well as the evaluation of teachers and students. By integrating and infiltrating the evaluation of curriculum ideological and political into the course process assessment, teachers have truly realized the purpose of teaching and educating people, and students can also internalize knowledge into externalized behavior, which greatly improves the quality of talent cultivation. Teaching and educating people is the mission of teachers. To integrate education into professional teaching, teachers need to constantly accumulate and expand their knowledge in the teaching process. On the premise of having sufficient professional knowledge, teachers should learn more about the current national politics and explore the educational elements related to professional knowledge to reduce the design difficulty; In addition, the lesson preparation team often prepares lessons collectively, and team members work together to reduce individual workload and improve the quality of education and teaching.

4. Conclusion

The research and practice of the teaching reform of "NC Programming and Processing" is crucial to the cultivation of NC professionals in application-oriented universities. Application-oriented colleges and universities need to clarify teaching objectives, focus on teaching content, teaching methods and evaluation standards, pay attention to practicality and applicability, give full play to the role of practical teaching, and improve students' practical operation ability and innovation ability. Only in this way can we cultivate more NC professionals who can meet the market demand, and promote the rapid development of China's NC technology.

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