Teaching Reform of Turning Skills Practical Training Based on the Concept of Outcome-Based Education

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Abstract. In order to improve the quality of practical training of turning skills for machining and mating majors, combined with the concept of Outcome-Based Education, we carry out teaching reforms in three aspects, namely, practical training content, practical training mode, and practical training evaluation, to achieve the purpose of comprehensively improving the quality of students and cultivating the ability of turning operation.

Keywords: OBE education philosophy, Turning skills training, reform of teaching

1 Introduction

Vocational education reform follows three basic concepts, namely, outcome orientation, continuous improvement, and student-centeredness [1,2]. Among them, the concept of Outcome-Based Education, or OBE, has become the mainstream concept of education reform in many developed countries as an advanced education concept[3,4].The core idea of OBE education philosophy is to focus on students' learning outcomes, and to let students' actual needs and behaviors determine the teaching content, teaching mode, methodological tools and evaluation methods[4]. This means that teachers should pay more attention to the applicability of knowledge, the comprehensiveness of ability and the overall improvement of students' quality in the teaching process, and promote the generation of learning outcomes by clarifying learning objectives, optimizing the learning process and improving the learning methods, instead of improving the quality of teaching by extending the teaching time.

The operation skill practical training of machining and mating specialty mainly includes three parts: turning skill practical training, clamping skill practical training and welding skill practical training. Among them, turning skills training is based on the students to master the basic theoretical knowledge of turning process, for the production and distribution technician job involves turning processing technology for practical training, that is, through the operation of the lathe to complete the turning processing of rotary body type parts[5,6]. Its training objectives are to be able to safely operate and maintain the lathe, to be able to correctly select and sharpen tools, to be able to turn and

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process typical and complex parts; to be able to formulate turning process routes and turning quality analysis, and to reach the skill level of National Vocational Skills Identification for Turning Workers (NVSIT) Level 4/Intermediate Worker. In this paper, by combining the concept of OBE education, the job requirements and workflow of the production and distribution technician are integrated into the practical training of turning skills, and the teaching reform is carried out in three aspects, namely, practical training content, practical training mode and practical training evaluation, so as to achieve the purpose of continuously improving the quality of practical training teaching.

2 Turning Skills Practical Training Content Reform

The traditional practical training of turning skills mainly centers around the operation of ordinary lathe training, including basic skills training and comprehensive skills training modules according to the idea of single to comprehensive. Among them, the basic skills training module from the outside to the inside, from the whole to the local idea mainly includes turning the outer cylindrical surface, turning the inner cylindrical surface, turning conical surface, turning threads, turning forming surface and surface finishing five projects; comprehensive skills training module from primary skills to intermediate skills according to the idea mainly includes turning typical parts and turning complex parts two projects.

With the continuous improvement of the level of automation and intelligence in the field of machining, the CNC lathe in the processing range, processing quality, processing efficiency have been greatly improved, while reducing the operator labor intensity. In the traditional ordinary lathe training based on the addition of CNC lathe training content, can facilitate students to understand and master the operation of this type of machining equipment and process flow. Students familiarize themselves with the structural composition of CNC lathe, basic operation, program setting, etc. to realize the CNC turning processing of parts, and comply with the safety operation regulations of CNC lathe and the implementation of CNC machining operation process in the training process.

Each training project contains a number of practical training tasks, task implementation process in line with the job workflow, roughly divided into the following steps: First, drawing reading, by reading and understanding the processing drawings, clear structure and shape of the parts, machining quality requirements, blank material dimensions, etc.; Second is the process of preparation, the main formulation of the processing steps and cutting dosage, the rational selection and sharpening of cutting tools, to complete the inspection of the lathe and preheating and lubrication; Third is the parts Processing, the main reasonable selection of measuring tools, complete the parts turning processing, strict compliance with safety regulations; four is the quality inspection, the main quality analysis of parts, writing skills training report; five is clean and tidy up, the main lubrication and maintenance of the lathe, cleaning and environmental sanitation. After completing all the practical training projects, students can have a more comprehensive understanding of the new technology, new equipment and new processes in

the field of turning processing, improve the comprehensive operation ability and innovation and application ability, and have the professionalism of love and dedication and the craftsmanship of striving for excellence.

3 Turning Skills Practical Training Mode Reform

Combined with the concept of OBE education, we implement the teaching concept of "student-oriented, skill-based, nurturing as the root" in the practical training of turning skills. Highlight the student's main position, around the students to choose the teaching mode, teaching methods and teaching tools to carry out turning machining operation training. Focusing on the cultivation of students' turning skills, emphasizing the proficiency of skills and the standardization of operation. Integrate the ideological and political education into the whole process of practical training to realize the unity of educating people and talents.

Deepen the integrated practical training model, use BOPPPS teaching structure in the practical training of turning skills, optimize and adjust the original practical training process of the four links of task introduction, task analysis, task implementation, task summary into three phases of the pre-, mid-, and post-stage and six links of Bridge-in, Objectives, Pre-assessment, Participatory learning, Post-assessment, and Summary. The pre-training phase consists of three segments: introduction, learning objectives, and pre-test, which are designed to stimulate training interest, clarify training objectives, and understand the training foundation. The middle stage of practical training is dominated by participatory learning sessions aimed at transforming training styles, upgrading the level of thinking, and reaching training goals. The later stage of practical training consists of two parts, post-test and summary, which are designed to test the training effect and consolidate the training results.

The overall practical training process is guided by the task-driven teaching method, combining with the work of the preparation technician to create practical training situations and tasks, students learn knowledge and mastery skills through the completion of the task. Based on the task-driven teaching method, a variety of teaching methods such as inspirational guidance, comparative analysis, group discussion, demonstration and imitation are comprehensively adopted. Among them, the three teaching methods of inspiring guidance, comparative analysis and group discussion are mainly used for the learning of process theory knowledge in the participatory learning process, which clarifies the turning process steps and process parameters before the operation training, and the students will use the theory to guide the practice in the process of analyzing and solving the problems. Effective stimulation, cause students to imitate the corresponding action, clear turning operation and operation skills before the operation training, through repeated practice to achieve proficiency.

In order to accelerate the generation of turning skills in the process of practical training, a variety of teaching methods such as network learning, virtual operation and practical training are fully utilized before and after the class, online and offline. Among them, network learning mainly uses video, animation and other multimedia teaching

resources in the class before and after the class by the students to complete the independent online; virtual operation mainly using the platform software to complete the simulation operation, virtual measurement, CNC programming, etc., in the operation of the training in the form of a group online and offline mixed to complete the turning process and the results of the validation; practical training to the general lathe turning processing as the main, CNC lathe turning processing as a supplement, in accordance with the teacher's first The practical training is mainly based on ordinary lathe turning processing, supplemented by CNC lathe turning processing, and the turning processing of parts is completed in the order of teacher's explanation and demonstration and students' independent practice. The explanation and demonstration is made with the help of stationary high-definition camera to solve the problem that the students can't see clearly and can't be seen, and the independent practice is made with the help of mobile high-definition camera for the centralized explanation of common and typical problems.

4 Reform of Practical Training Evaluation of Turning Skills

Based on the concept of OBE education, benchmarking the national vocational skills standard for intermediate turners, and centering on students' practical operation and quality improvement ability, the evaluation of practical training in turners' skills includes two parts: process evaluation and summative evaluation. Among them, process evaluation includes practical training performance, quality of parts processing, quality of practical training report writing and other forms, mainly in the process of practical training to assess the use of students and maintenance of lathes and tools, tool selection and sharpening, process development and parameter selection, turning quality analysis and optimization and improvement, accounting for 40% of the total score; summative evaluation includes process theory oral examination, operational skills assessment and other forms, mainly in the practical training After the end of the assessment of the students' use of measuring tools, process, processing quality, operating standards, operating time and other aspects, accounting for 60% of the total score.

5 Turning Skills Training Reform Practice

In accordance with the OBE education concept based on the idea of practical training reform of turning skills, comprehensive skills training module in turning typical parts project "turning locking pin" task as an example to illustrate the specific practical training process. The locking latch model is shown in Figure 1.

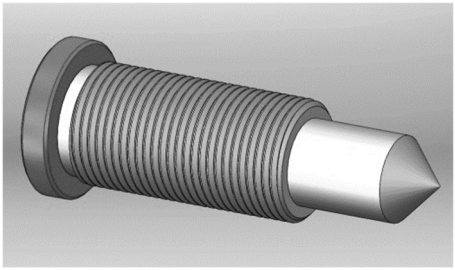

Fig. 1. Locking pin.

Before the practical training, the teacher shares the learning resources and assigns pre-testing tasks, and the students are prepared for the pre-testing.

Practical training, to "do" as the center, through the teacher's "do in teaching", the student's "do in the middle school", teachers and students together "do in evaluation ", forming a closed loop teaching, highlighting the key points of teaching, cracking the teaching difficulties, to achieve the objectives of practical training. The practical training was organized according to the six segments of the BOPPPS teaching structure, as shown in Table 1.

Table 1. Turning skills training process.

teaching link	Design intent and process
Bridge-in	By creating an emergency repair situation, the locking pin turning task is introduced to stimulate students' interest in training.
Objectives	Help students clarify their training goals.
Pre-assessment	Clarify machining steps and cutting amounts through problem-guided and comparative analysis.
Participatory learning	Teachers realize "teaching by doing" through explanation, demonstration and guidance, and students realize "learning by doing" through observation, imitation and practice. It is organized in the order of teachers explaining and demonstrating first and students practicing in groups.
Post-assessment	Learning is tested through group discussions and quality analysis is completed in a connected format.
Summary	Summarize the operation process, emphasize the operation essentials in the form of a jingle to deepen students' impression.

After the practical training, students complete the practical training report, summarize the operation methods and experience, and lay a solid practical foundation for the completion of subsequent project tasks.

6 Conclusions

Implementing the concept of OBE education and carrying out teaching reforms on the practical training of turning skills of machining and mating majors in three aspects of practical training content, practical training mode and practical training evaluation is in line with the teaching orientation of realizing students' independent learning and comprehensive application of skills, which is conducive to achieving the purpose of comprehensively improving the quality of students and cultivating their comprehensive operation ability, and helps to continuously improve the quality level of practical training teaching. In the later stage, the turning teaching group will combine the comprehensive skills training of manufacturing and distribution with the comprehensive practical training program with mechanical specialty features by integrating parts mapping, electro-mechanical-hydraulic transmission control and other specialized contents.

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