Vocational school "Mold material selection and forming" on Process Teaching

Wang Zhen, Wu Yuyin

Shandong Transport Vocational College, Weifang Shandong, 261206, China

Keywords: Mold Material Selection and Molding; Process Teaching; Analysis

Abstract: Mold material selection and forming is a professional basic course for students majoring in mold design and manufacturing in higher vocational colleges. In the long-term teaching practice, the author explores the process teaching of this course, strengthens the training of professional basic skills, so as to lay a solid foundation for the subsequent professional courses of mold specialty.

In the continuous exploration and practice of the process teaching reform in higher vocational colleges, mold material selection and molding is a professional basic course for students majoring in mold design and manufacturing. After graduation, no matter what position they are engaged in, design or manufacturing, they must first consider the "high quality and low price" of mold parts and materials, so as to ensure zero mold On the premise of meeting the use requirements, the cost of components is reduced to the lowest and the economic benefits are obtained as high as possible. Then, the course "mold material selection and molding" plays an important role in the curriculum of the whole mold design and manufacturing specialty. Its process teaching reform will also drive the teaching reform of the mold design and manufacturing specialty. By exploring the process teaching of this course, we strengthen the training of professional basic skills, and strive to better connect with the follow-up professional courses, so as to lay a solid foundation for the mold professional personnel training.

1. Course orientation

After discussing with the teachers of brother colleges and the experts of famous enterprises in the mold industry, as well as the follow-up survey of graduates, we determined that the mold design and manufacturing major should cultivate senior skilled talents who can understand design, program, process, assemble and trim. That is to say, mold design and manufacturing specialty should cultivate mold designer, mold processing technician, mold processing operator and mold fitter. Then we transform the ability demand of the working field to the learning field. After analyzing the corresponding position ability of these positions based on the working process, we can analyze the required knowledge demand and transform it into the core courses required by the mold design and manufacturing Specialty: plastic molding technology and mold design, stamping technology and mold design, mold manufacturing technology, mold numerical control processing technology Technology, die fitter technology. These courses need a course as a guide to support the follow-up core professional courses. Because the material selection is the first thing to be done in plastic forming process and mold design, stamping process and mold design when designing mold parts, and the blank selection is the first thing to be done in mold parts manufacturing process programming, mold numerical control processing and mold fitter, which is exactly what this course will teach.

2. Course objectives

Knowledge objective: what can students learn through this course? Five knowledge points: Types, properties and selection of common mold materials. The common blank and its selection of die parts. Common heat treatment process and arrangement of die parts. The general cutting technology of the blank of mould parts, Operation basis of fitter for die assembly.

Ability objective: what can students do after learning this course? Four abilities: Reasonable

material selection in the course of mold design. In the aspect of mold processing technology, it can reasonably select blank and arrange heat treatment. Able to carry out common cutting operations of mold blanks in the course of mold parts processing. Able to carry out basic fitter operation of mold in the course of mold assembly and repair processing.

Quality objectives: what kind of talents should this course cultivate?

Independent learning talents: teaching cases and task cases are arranged for each task. Teachers guide teaching content with teaching cases. Students refer to teaching cases and complete relevant content of task cases independently.

Team cooperation talents: the development of a set of molds requires the joint efforts of all aspects of mold design and manufacturing, and mold personnel must work together to develop high-performance and good efficiency molds.

3. Analysis of learning situation

At the beginning of study, considering from the students' side, before learning this course, through the study of the material mechanics part of engineering mechanics, the students have initially understood the relevant knowledge of material mechanics, such as strength, rigidity, allowable stress, elastic modulus, fatigue limit, etc., but there is no specific understanding of how to apply it in the mold industry. In addition, before learning this course, through the study of mechanical drawing, students have mastered the basic knowledge of drawing, and have a certain ability of reading and understanding drawings. For the students just involved in the field of machinery, the level of learning strategies for professional knowledge is not high, and it is difficult to understand and accept the knowledge in the professional field, and they are more interested in some specific common cases related to molds. For example: gasket, car cover, mobile phone shell, plastic bucket, etc. In addition, the enrollment of mold design and manufacturing majors is often both liberal arts and science, and the level of basic knowledge is uneven. Therefore, for the study of this course, we use the group system, pay attention to the advantages and disadvantages when grouping, and arrange the students to complete the expansion after class. Under the guidance of the classroom, all students must complete the relevant contents of the task case, and set up multiple tasks in the key and difficult parts, and practice more to facilitate consolidation. All cases are practical cases closely related to the mold industry. These cases are collected in the process of teachers' on-the-job practice, and then screened according to students' cognitive level in teaching application. The selected cases are all specific cases that students are interested in and closely connected with practice and the development of the times.

4. Teaching design

Based on the principle of training talents from the needs of post and the guidance of working process, we have made a choice and reconstruction of teaching content.

Based on the investigation of the mold major in the domestic vocational colleges, we can draw the conclusion that there are two kinds of courses for the mold design and manufacturing major in the Higher Vocational Colleges: one is to open the metal technology first, then the mold material, the other is to open only the mold material and heat treatment. Starting from the needs of the post and based on the principles of "practicality" and "Sufficiency", we have integrated the two courses into a new course. Metal technology has removed the content of little contact with the mold industry. Mold materials and heat treatment have been introduced into the knowledge that keeps pace with the development of the times: new mold materials, cemented carbide, imported steel, etc. in addition, we have embedded the knowledge of intermediate lathe workers and fitter workers In the course education system, students are encouraged to participate in the vocational qualification certificate examination, and the cultivation of students' professional ability is highlighted.

Through the exchange with previous students, we have come to the conclusion that as a professional basic course related to subsequent multiple professional courses, the knowledge points of this course are many and scattered. We find that students often don't know how to start learning

when learning this course, and they don't know what to master when facing many knowledge points. After discussion with the enterprise, in order to facilitate students' understanding and mastery, we determined to set up teaching content according to the mold development process, and the completion of each task is to simulate the mold development process of the enterprise.

Then we combine the knowledge with practice and determine nine learning situations. And these nine learning situations are sequenced according to the application demand and the law of professional growth in the mold industry. According to the working process of mold development design and manufacturing, classify them, arrange class hours, internal of each content system, simulate the teaching situation according to the main types of mold parts, and set up several typical tasks in each teaching situation as the main support of teaching content to carry out classroom teaching. As shown in Table 1.

Table 1 Setting of learning situation

No.	Learning situation	Knowledge points
I	Performance requirements, common materials and heat treatment of mold base (task case: cushion block)	Cast iron
II	Performance requirements, common materials and heat treatment of fixed plate (task case: unloading plate, die handle)	Carbon structural steel
III	Performance requirements, common materials and heat treatment of parts of pushing mechanism (task case: sprue sleeve)	Carbon tool steel
IV	Performance requirements, common materials and heat treatment of die core (task case: plastic mold core, die casting mold core)	Alloy steel and cemented carbide
V	Blank selection and machining of die base (task case: cushion block)	Billet - milling and drilling
VI	Blank selection and machining of fixed plate (task case: base plate, discharge plate)	Forging stock -- + planing and reaming
VII	Blank selection and general machining of punch (task case: die handle, reset lever)	Forging stock -- turning and grinding
VIII	Blank selection and general machining of die (task case: push board)	Forging stock -- milling, drilling and reaming
VIIII	Assembly and repair basis of plastic mold parts (task case: stamping die, die casting die)	Fitter, welding repair

These nine learning situations are all based on cases, and are introduced by typical work tasks. Tasks are given at the beginning of class to let students know what we are going to do in this situation. The design tasks given here will run through the teaching of this situation.

The tasks of the first four learning situations complete the selection process of the materials for the mold parts of the simulation enterprise, that is: according to the working conditions of the parts, analyze the performance requirements, take into account the process performance and economic performance, select the appropriate materials, and analyze the heat treatment process arranged to improve the performance. Students are required to draw inferences from one instance and take parts as carriers, analyze the material selection of mold parts with similar working conditions, and constantly improve their skills. Moreover, these four learning situations follow the rule from simple to complex, from shallow to deep, and step by step. The process of completing tasks in these four learning situations repeats the steps and does not repeat the contents. In the process of completing the task, students gradually master the knowledge systematically and improve their ability.

The task of the sixth to eighth learning situations is to complete the blank selection and processing technology selection of the mold parts of the simulation enterprise, that is, to select the appropriate blank and processing technology for the mold parts according to the shape

characteristics and accuracy level of the parts, and students are required to draw inferences from one instance, Based on the parts, the blank and machining process selection of die parts with similar shape features and accuracy level are analyzed.

In each learning situation, the teacher takes the teaching case as the lead to teach the selection method of typical mold parts materials, blanks and processing technology, and then requires the students to complete the learning task list required by the task case. As shown in Table 2, it is one of the task lists of the fourth learning situation.

Table 2 learning task list

<table>
<tr><td colspan="2">Learning situation 4: performance requirements, common materials and heat treatment of die core</td></tr>
<tr><td colspan="2">Task 1: performance requirements, common materials and heat treatment of gasket punch</td></tr>
<tr><td colspan="2">Learning objectives:
1. Be familiar with the performance requirements and common materials of stamping die parts.
2. Master the common heat treatment process of stamping die parts.
Capability objectives:
1. Be able to analyze the working conditions and performance requirements of stamping die parts.
2. Be able to select suitable materials for stamping die parts.
3. Be able to arrange reasonable heat treatment process for stamping die parts.</td></tr>
<tr><td colspan="2">Content to be submitted</td></tr>
<tr><td rowspan="2">1. Analysis of working conditions</td><td>Score</td></tr>
<tr><td>Signature of evaluator:</td></tr>
<tr><td rowspan="2">2. Performance requirements</td><td>Score</td></tr>
<tr><td>Signature of evaluator:</td></tr>
<tr><td rowspan="2">3. Material selection and heat treatment process arrangement</td><td>Score</td></tr>
<tr><td>Signature of evaluator:</td></tr>
</table>

5. Teaching methods

In order to facilitate students' understanding and mastery, we mainly adopt the following four teaching methods:

5.1 Case analysis

Each learning situation is the work task of virtual enterprise, and each case is the real case of enterprise, and the completion of each task is a complete work process. Through the completion of the task, students will have a sense of identity to the responsibilities and ability requirements of future jobs, and let students realize the lack of knowledge, and further encourage students' initiative in learning.

5.2 Group discussion

For each task, students are required to analyze, discuss and determine the plan within the group to complete the task. Then the groups were compared. Analyze the completion of tasks and correct your own tasks. Let students participate and think more.

5.3 Heuristic guidance

Give full play to the initiative of students in the course of teaching, so that students can truly integrate into the classroom, and require students to draw inferences from one instance, take parts as the carrier, analyze the processing of similar mold parts.

5.4 On site teaching method

In the whole process of course teaching, we should make full use of the training base, virtual enterprise and virtual task, and design and process mold parts according to the working process of the enterprise. In addition, it also adopts the "invite in" approach, that is, to hire enterprise engineering and technical personnel for on-site guidance, invite enterprise experts to participate in

the teaching process, and teach teachers to listen to lessons in class, which achieves two things with one stone. On the one hand, it is convenient for the improvement of the quality of teachers with two teachers, on the other hand, it is also convenient for the further deepening of the teaching mode reform of this course.

6. Assessment and evaluation

The evaluation of students' performance consists of three parts, and the specific evaluation contents are shown in Table 3.

Table 3 student performance evaluation form

Form of evaluation	Proportion	Assessment contents	Score
Usual performance	20%	1. Attendance 2. Learning attitude 3. Operation completion	
Task assessment	40%	1. Sense of responsibility 2. Ability to collect materials and research 3. Task completion 4. Team spirit	
Final exam	40%	1. Theory test 2. Practical assessment	

Among them, the proportion of task assessment is specially increased, mainly to highlight the process assessment, and the task assessment result is the average of multiple tasks in the learning situation.

7. Conclusion

After the implementation of process-based teaching, students' enthusiasm for learning has been improved, students' learning and doing have been closely combined, and knowledge has been used flexibly. At the same time, teachers' teaching ability and level have been improved. Finally, we have not only successfully completed the teaching task, but also improved the level of skill competition and skill appraisal training, as well as the social training and external processing ability of our training base Power.

References

[1] Li Daxin, Zhang Xiumian. Summary of mold technology status and development trend [J]. mold manufacturing, 2005, (02).

[2] Zhu Xianyong. Research on ductile iron material and its near final forming process for medium and large stamping dies [D]. Jilin University, 2007.

[3] Jiang Dayuan. New theory of vocational education research [M]. Education Science Press, 2007.