Research on Application of Comprehensive Teaching Design into the Teaching of Cold Stamping Forming Technology and Die Design

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***Abstract*—Many problems existing in the current teaching process of cold stamping forming technology and die design, including the vague teaching target, poor learning effect, and students can't complete the task of learning independently, etc. These problems can be effectively solved based on the comprehensive learning design combining with the online learning mode. Students can effectively carry out the learning task and improve the quality of the course learning in the comprehensive learning environment.**

Keywords—Cold stamping forming technology and die design, Comprehensive teaching design

I. INTRODUCTION

Comprehensive study design was originally proposed by van Merriënboer in 1997. It has been recognized as one of the most competitive theory of teaching design to improve teaching efficiency in the international training and teaching world. Comprehensive teaching design is a kind of integration design method, integrated the declarative learning, procedural learning and emotional learning[1, 2]. Students are required to master a set of comprehensive learning objectives, knowledge, skills and attitude in a rich-interconnected system through a comprehensive study, and better to move to what they have learned in daily life and work situations.

Cold stamping forming technology and die design is the core curriculum of the Molds Design and Manufacturing Speciality[3,4]. The comprehensive application of the course is very strong[5]. Many problems existing in the traditional teaching process, including students cannot achieve mastery comprehensively and the student's mold design techniques cannot be effectively improved. It has been an urgent need to solve the problem in order to better grasp the learning objectives of this course[6]. The learners attempts to apply the comprehensive teaching design to teaching process of stamping forming technology and die design. And the design blue print of the design process and model of evaluation was carried out.

II. ORGANIZATION OF TEACHING PLAN

A. The teaching goal of comprehensive teaching design in cold stamping forming technology and die design

Cold stamping forming technology and die design is one of the compulsory courses of the Molds Design and Manufacturing Speciality and is very important in the whole teaching system. The course is a special subject, which is strongly integrated with knowledge, technology and practice. The students should be guided to complete the tasks step by step to achieve the knowledge and solve the problem of punching die design, resulting in the effectively improvement of students' ability of mold design.

B. The comprehensive teaching design in cold stamping forming technology and die design

The comprehensive teaching design of the course is completed according to ten steps of the comprehensive teaching design. Firstly, a whole real learning task should be chosen. For example, there are three parts of the blanking die design, from simple to complex. And the last part should be done by using UG software and needed to give specific drawing parts of blanking die. The Scene category of comprehensive teaching design is shown in figure 1. Each category has a specific teaching design blueprint. For example, the blue print of the last category is shown in Table 1.

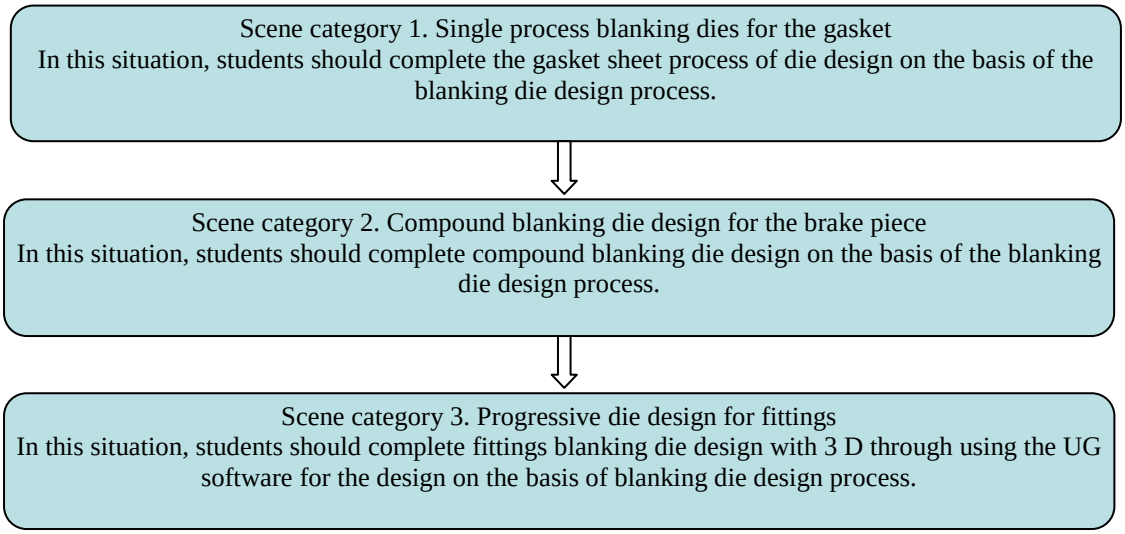

Fig. 1. The scene category of comprehensive teaching design

TABLE I. THE SITUATIONAL TEACHING DESIGN BLUEPRINT IN SCENE CATEGORY 3

Scene category 3	Progressive die design for fittings: In this situation, students should complete fittings blanking die design with 3 D through using the UG software for the design on the basis of blanking die design process.			
Present knowledge: the case study method Provide students with typical die structure of progressive die. Give characteristics instructions of the progressive die design (such as layout, work station design, guide pin, etc.)				video, PPT
Present knowledge: the case study method Provide students with main point related with UG software in the process of progressive die design				video, PPT, actual operation
Present relevant knowledge: present strategy 1 parts process analysis 2 the scheme determination of parts forming 3 part drawing 4 layout 5 impact force and determine the pressure center 6 parts design work 7 positioning parts design and mold assembly drawing				Video
Present related knowledge: to present in the mind 1 how to process the metal parts are analyzed and the forming scheme selection is determined 2 specific parts are analyzed and systematic design thought is given				Video
Learning task 3.1 case study method Provide students with a typical structure of progressive die, and its special function	Micro course + explanation	Provide learning support Provide students with knowledge and skills	Micro course + explanation	Practice online
Learning task 3.2 case study method Provide students with UG actual operation in the process of progressive die design	Micro course + explanation	Provide learning support Provide students with knowledge and skills	Micro course + explanation	
Learning task 3.3 The simulation method of problem solving Provide students with progressive die design with similar problems, according to the design process, mold design drawing	practice	Provide learning support Provide students with knowledge and skills	Micro course + explanation	
Learning task 3.4 The error correction method to solve problems Provide students with a few progressive blank die models with 3D.	practice	Provide learning support Provide students with knowledge and skills		
Evaluation feedback				Evaluation
Topic discussion: how to design the progressive die by using UG?				Evaluation

C. The implementation steps of comprehensive teaching design in cold stamping forming technology and die design

1) Task arrangement

Before starting the class, the students are divided into several groups based on learning situation analysis of the students. Each group has a group leader. The group leader is responsible for collecting homework and organizing other group members to participate in group discussion. Students can share their learning resources. The various course resources and teaching design blueprint for the teaching information could be founded in the online learning platform. The tasks should be ordered to everyone at the first meeting of the class. The three scene categories should be completed within the stipulated time step by step, resulting in completing the course of the ultimate task of blanking die design module.

2) The learning process

a) Task layout

In order to complete the learning task, as shown in figure 1, Teachers should focus on students' learning dynamic and real-timely grasp each student's learning process in the whole term. Support and help should be provided to the students with learning difficulties immediately. The learning resources should be adjusted timely according to the requirements of students in learning activities. Various forms of learning resources can be supported during the whole term, including text, video, micro class, animation, etc.

b) Collaborative discussion

The mould drawings can be shared between team at the end of each category. The theme of discussion should be developed by teachers. For example, It should be discussed the topics that how to use UG software to design the mould efficiently at the end of the last scene category. Various forms of mutual exchange and discussion should be promoted between groups and teachers.

c) Evaluation feedback

The evaluation results of teachers relating to the students' completion of part drawing and each task should be timely fed back to students. The formation of the final examination resulted from the three aspects, including the students' learning attitude, learning process and task completion.

D. The preliminary evaluation of comprehensive teaching design in cold stamping forming technology and die design

1) Evaluation data collection

After a year of teaching, the data collection was analyzed in order to verify the learning mode based on integrated teaching design study effect. And then teachers can timely find problems and perfect the comprehensive teaching design.

The design of the questionnaire is based on the theory model of technology acceptance model in order to analyze the student's acceptance and satisfaction of the teaching mode. Technology acceptance model is one of the most widely used models in the information system research. The theoretical model can be applied to different teaching modes. The evaluation and selection of teaching models should be obtained through the empirical research.

The questionnaire is mainly related to the three aspects, including perceived usefulness, attitude and behavioral intention to the teaching model. And the result is shown in table 2. Investigation process was done in anonymous way. A total of 150 questionnaires were done on the spot and the effective rate of the questionnaire was 100%.

TABLE II. THE EVALUATION RESULTS OF THE TEACHING MODE ANALYSIS

Questionnaire categories	Questionnaire topics	Very satisfied with /%	satisfied /%	general satisfaction /%	unsatisfied /%
perceived usefulness	Situational design can improve the learning interest	12.2	75.6	12.2	0
	Teaching design blueprint and teachers' explanation is more conducive to the goal of learning tasks	16.3	72.3	10.4	0
	Learning resources can meet with the requirement of learning	10.5	70.8	18.7	0
	evaluation and topic discussion is helpful to learning	8.4	72.8	15.6	3.2
	Design can meet with the requirement of personalized learning	5.1	53.9	30.5	10.5
attitude to the teaching model	Students like to use this kind of teaching model	15.6	75.8	8.6	0
behavioral intention to the teaching model	Looking forward to the next comprehensive type teaching model	15.6	73.5	10.9	0

2) The preliminary results

The teaching mode study effect analysis showed that 87.8% of the students were satisfied with the learning task design. 88.6% of the students thought that the teacher and the teaching design activities were effective. 81.3% students were satisfied with the resources in a learning activity. 81.2% of the students thought that teacher feedback of study topic discussion was helpful. 91.4% of the students liked this kind of learning mode, and 89.1% of the students thought that the teaching model should be promoted to other courses. Similarly, the significant increase of the scores of the students' academic performance at the end of term was also showed.

III. SUMMARY

Several aspects of the comprehensive teaching model are needed to be improved. For example, the satisfaction of personalized needs of is only 59%. The students' learning difficulty should be timely understood to meet different level of students. In addition, the group discussion should be started from actual learning situation. Teachers should make full preparation and guide the work to strengthen the reflection and summary and thus improve the quality of teaching.

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