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On the Exploration and Practice of Work Study Integration Teaching Reform of *'Mechanical Drawing and Computer Aided Drawing CAD'* Course Based on Task Driven and Action Oriented Teaching Method in Technical Colleges

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Abstract: *The course of 'Mechanical Drawing and Computer Aided Drawing CAD' is an important basic course of technology for mechanical specialty in technical colleges. This paper takes the integration of engineering and science teaching reform of 'Mechanical Drawing and Computer Aided Drawing CAD' course in technical colleges as the starting point, expounds the exploration and practice of task driven + action oriented teaching method in the reform, and further analyzes the process of the reform based on task driven + action oriented method. It is hoped that it can provide some reference for the integration of engineering and learning teaching reform in mechanical specialty courses in technical colleges.*

Keywords: *Technical colleges; Task driven + action oriented teaching method; 'Mechanical Drawing and Computer Aided Drawing CAD'; Integration of work and study*

1. Introduction

The course of *'Mechanical Drawing and Computer Aided Drawing CAD'* is an important professional practice course of mechanical specialty in technical colleges. It covers the national standard of mechanical drawing, the law of positive projection, the assembly, part drawing, assembly drawing and computer aided drawing CAD skills operation, which has great practicability in the practical position of enterprises. In recent years, under the guidance of the high promotion of the "craftsman spirit" in technical colleges, the technical colleges have promoted the integrated teaching reform of the course of *'Mechanical Drawing and Computer Aided Drawing CAD'*. Because of the tight time and many tasks, the teaching reform is difficult, the curriculum reform based on task driven + action oriented teaching method integrates typical cases into daily teaching, simulating the real working situation of enterprises. Through completing typical tasks of simulation enterprises, students master the knowledge points and skills of the course in the course, and reduce the difficulty of teaching reform through completing typical tasks of simulation enterprises, then to construct an efficient and high-quality interactive classroom between teachers and students. Based on this, it is imperative to explore the integration reform of teaching and learning based on task driven and action oriented teaching method in technical colleges.

2. Based on the task driven + action oriented teaching method in the *'Mechanical Drawing and Computer Aided Drawing CAD'* course of work integrated teaching reform to explore practical objectives

Task driven + action oriented teaching method is an organic combination of theory and practice. The first mock exam is applied to the integration of CAD and mechanical engineering graphics.

2.1 Cultivating students' ability of reading drawings and innovative design

As the main training objectives of the course of *'Mechanical Drawing and Computer Aided Drawing CAD'* are mechanical draftsman and 3D modeler, which all need to face specific parts before they can draw. Therefore, it is necessary to take the cultivation of students' ability of drawing

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recognition and innovative design as the primary goal. Drawing reading ability is one of the independent abilities required by mechanical design and manufacturing enterprises. In practice, it is necessary to refine the objectives in combination with specific contents (Zhou,Gong, 2019,P:293-294). For example, students are required to understand the assembly relationship of standard parts and common parts in the drawing, and skillfully draw threaded connectors according to the drawing. The ability of innovative design requires students to draw the creative idea of the third view according to one view or two views.

2.2 Broaden students Employment

In the teaching process of mechanical drawing integrated with computer aided drawing CAD, computer aided drawing becomes the main means to express the final design results. Mastering computer aided drawing skills has become an inevitable requirement for students to adapt to the development of the times. Therefore, when setting the teaching goal of work study integration of *'Mechanical Drawing and Computer Aided Drawing CAD'* course based on task driven and action oriented teaching method, we should advocate the dual certificate employment mode of diploma certificate, vocational qualification certificate, simultaneously cultivate students' ability to adapt computer aiede drawing skills to the needs of enterprises, promote students to obtain the professional qualification certificate of mechanical draftsman at the same time, and further broaden the employment path (Man,Zhang,2019,P:104-105).

3. Based on the task driven + action oriented teaching method in the *'Mechanical Drawing and Computer Aided Drawing CAD'* course work integrated teaching reform to explore the practice process

3.1 Before class, the teacher releases the task learning list

Pre class task learning sheet is the main basis for the practice of task driven + action oriented teaching method in the teaching reform of *'Mechanical Drawing and Computer Aided Drawing CAD'* course, which can help students understand the pre class learning objectives and tasks more clearly, and provide the basis for the synchronous realization of "preparing students" and "preparing content"(Li, 2017, P: 118-121). In the process of setting up task learning list before class, teachers should base on the point of students' knowledge exploration and control the whole situation purposefully. According to the teaching practice, we set up a number of sub tasks, and release the requirements of sub tasks to students before class. Taking the sub task "arc drawing" in the subject of "drawing of simple mechanical parts" as an example, the task requirements and achievement criteria are as follows: master the accurate drawing methods, such as setting polar axis, object capture, etc., analyze the known line segments, positioning circles and arcs, master the method of drawing angle lines by polar axis, and the method of drawing arc connection by tangent, fillet, radius, etc, Master trim, offset, copy and other commands.

After the pre class task learning list is set, teachers can record several cases micro video from the aspects of the center way and tangent mode according to the implementation steps of the learning list. In the video, some related problems are put forward, such as "how to determine the tangent point position of arc and straight line", "how to determine the circle with the point as the center of the circle when the arc passes through a certain point" and other related problems are put forward. Under the guidance of relevant problems, students can be helped to complete the learning of knowledge points and skills points smoothly. Students are encouraged to learn independently after mastering the knowledge points and skills points, highlight the key points and solve difficulties, and lay the foundation for learning the following knowledge points.

3.2 Teachers and students explore new knowledge together in class

The cooperation between teachers and students is based on the task driven + action oriented teaching method in the *'Mechanical Drawing and Computer Aided Drawing CAD'* course work integrated learning teaching reform advocated by the learning mode. In order to avoid the collaborative process between teachers and students in the actual curriculum becoming mere formality, teachers can use the limited resources to construct the integrated teaching site of work study integration. In the integrated teaching site of work study integration, teachers can choose the appropriate teaching method mode and arrange the teaching content properly (Sun, Feng, Zheng, Fang, 2020, P: 247-249).

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3.2.1 Construction of teaching site

'Mechanical Drawing and Computer Aided Drawing CAD' course work study integration teaching site is to let students in the simulation enterprise environment to complete work projects, master post skills and solve practical problems of comprehensive professional ability, its construction success is related to the teaching practice effect. Therefore, teachers can start from the corresponding jobs of CNC lathe workers, CNC milling workers, mold design and manufacturing, mechatronics and other mechanical manufacturing industries, and investigate the skills needs of specific jobs. Relying on the teaching and training factory, we can build an integrated teaching and training site which is closely connected with the enterprise posts. On the basis of the original multimedia computer room, through the division and operation of the information interaction area, the theoretical manual drawing area, and the disassembly and measurement area, we can promote the teaching site to have the functions of data access, multimedia teaching, manual drawing, disassembly and mapping Computer graphics and other functions.

3.2.2 Arrangement of teaching content

Based on the universality and practicality of CAD software involved in the course of *'Mechanical Drawing and Computer Aided Drawing CAD'*, as well as the difference of basic course knowledge that students of specific majors need to master, teachers can reconstruct the segmented content in the form of modular teaching resource development by combining standard engineering with integrated teaching site construction standard. For example, after mastering the basic drawing, modifying and editing functions of the software, the mechanical students focus on the drawing process of typical plane drawing, dimension modification and annotation, three views, part drawing and assembly drawing in AutoCAD, and insert the conceptual knowledge of "layer", as well as "dimension tolerance", "section line filling", etc "Form and position tolerance" marking and other content, and ultimately form the ability as the core, to the typical mechanical drawings of enterprises as the carrier, from easy to difficult, modular combination of teaching content.

3.2.3 The choice of teaching method and mode

In the process of teaching reform of *'Mechanical Drawing and Computer Aided Drawing CAD'* course, theory and practice complement each other. In terms of innovative teaching mode, according to the teaching content, teachers can choose the teaching method suitable for task driven + action oriented mode(Zhou,2018,P：84-85). For example, in the teaching process of "drawing simple plane graphics", teachers can introduce the flipped classroom teaching method, focusing on guidance, rather than simply telling directly. Especially in the process of drawing instruction of arc connection part, teachers can guide students to analyze the relationship between the intersection point of straight line and circle and the center of arc from the "setting dimension and positioning dimension" of mechanical drawing knowledge; In the teaching process of "intersection line and intersection line", teachers can choose brainstorming + action oriented teaching method.

3.3 After class multi-dimensional assessment

The traditional paper-based assessment model is not suitable for the integration of work and study based on task driven and action oriented. Therefore, teachers can start from the process; comprehensively consider the drawing works, learning attitude, knowledge emotion, team cooperation and other diversified factors, combined with the task card corresponding to each classroom task, design a scientific, fair and practical multi-dimensional evaluation method.

In terms of drawing ability, the excellent students scored 54-60 points, which showed that the number of information exchanges between teachers and students was more than 10 times, the number of votes was in the top three, the work display was praised more than 20 times, and the drawing task was completed ahead of time; The score of good students is 42-54 points, which shows that the number of information exchanges between teachers and students is more than 5-10 times, the number of votes is 4-20, the works display is praised more than 10 times, and the drawing task is completed on time; The score of the qualified is 36-42, which shows that the number of information exchanges between teachers and students is more than 1-5 times, the number of votes is 21-40, the works display is praised more than 3 times, and the completion of the drawing task is a little overtime; The score of the unqualified is below 36, which shows that there is no information exchange between teachers and students, the number of votes is below 40, the work display is not praised, and it is difficult to complete the drawing task.

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In terms of learning attitude, including attendance records and classroom performance, the excellent students scored 18-20 points, which showed that they were not late, did not leave early, listened to the class carefully and completed the task with excellent quality; The score of good students was 14-18 points, which showed that they were late or left early twice, and they listened to the class carefully and completed the task well; The qualified students scored 12-14 points in this item, which showed that they were late, left early for 5 times or absent from class for 1 time, less attended the class and completed the task generally; The score of unqualified students is below 12 points, which shows that they are late, leave early for more than 5 times or absent from class for more than 2 times.

In the aspect of knowledge and emotion, the excellent scored 9-10 points, which showed that they were full of confidence, had a sense of expectation for the follow-up tasks, and were willing to share with others; The score of good students is 7-9, which shows that they are confident and have a sense of expectation for follow-up tasks, and often share with others; The scores of those who are qualified are 6-7 points, which shows that they are lack of confidence, have no expectation of follow-up tasks, and seldom share with others; The score of the unqualified is less than 6 points, which shows that they are frustrated and afraid of follow-up tasks, have a sense of expectation, dare not or never share with others.

In terms of team cooperation, including data sharing and team cooperation, the score of excellent students is 9-10, which shows that they are willing to cooperate with classmates and share information and experience; The score of good students is 7-9, which shows that they often cooperate with classmates and can share information and experience with classmates; The score of the qualified students is 6-7, which shows that they seldom cooperate with classmates and occasionally share information and experience with classmates; The score of unqualified students is less than 6 points, which shows that they are not willing to cooperate with classmates and share information and experience with classmates.

The self-evaluation of each task accounts for 30%, the group evaluation accounts for 30%, and the teacher evaluation accounts for 40%.

4. Based on the task driven + action oriented teaching method in the *'Mechanical Drawing and Computer Aided Drawing CAD'* course of work integrated learning teaching reform exploration and practice effect

Taking the mold design and manufacturing class in my school as an example, comparing the 2016 curriculum reform with 2019 after three curriculum reforms, the students' knowledge and skill proficiency increased from 38% to 77%, the interest in learning increased from 47% to 83%, the excellent rate increased from 30% to 67%, and the satisfaction of internship enterprises increased from 50% to 85%. Through the statistical data before and after the curriculum reform, which shows that students' proficiency in knowledge and skills, learning interest and academic performance have been greatly improved, students' comprehensive professional ability has been significantly improved, and they have been highly praised by internship enterprises, forming a virtuous circle of teaching quality and high-quality employment.

5. Conclusion

To sum up, in recent years, in the process of teaching reform of *'Mechanical Drawing and Computer Aided Drawing CAD'* Course in technical colleges, remarkable results have been achieved, but there are still some shortcomings. Therefore, in the follow-up reform process, teachers of technical colleges should pay attention to continuously explore new teaching methods. Reasonable use of task driven + action oriented teaching method, improve students' classroom participation, promote students to adapt to the enterprise work mode in a short time, and realize the effective improvement of professional skills and employability.

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