

Research on the Project-based Teaching Reform of the English Third-Angle Projection Method Engineering Drawing Reading and Drawing Course

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ABSTRACT

The course "Reading and Drawing of Engineering Drawings Using the Third-Angle Projection Method in English" is designed to enhance students' ability to read and draw engineering drawings using the third-angle projection method in English. Its teaching effectiveness directly affects students' employability. Based on the theory of project-based teaching, this article conducts a detailed study on each teaching link of the "English Third-Angle Projection Engineering Drawing Reading and Drawing" course in higher vocational colleges, forms a plan for the project-based teaching reform of the course, and discusses several teaching experiences of this course in light of the characteristics of English third-angle projection engineering drawing and in combination with teaching practice.

KEYWORDS

The English third-angle projection method engineering drawing reading and drawing; Project-based teaching; Teaching reform; Third-angle projection method

1 Course introduction and teaching orientation

Most enterprises in the Suzhou area are export-oriented and undertake the processing of many external orders. Due to the inconsistent standards at home and abroad and the time constraints, it is impossible for manufacturers to convert all the drawings and technical documents of the products they undertake to be processed into corresponding national standards familiar to engineering and technical personnel. This requires engineering and technical personnel to be familiar with the standards of foreign countries, especially advanced ones in Europe, America, Japan, etc. Most of the students in our school are employed in the Suzhou area. Although they are very familiar with the standard mechanical drawing of our country, when they encounter the engineering drawing of the third-angle projection method in English in actual work, they often find themselves in an awkward situation where they cannot understand it. During the communication with many department heads and front-line engineers of our numerical control technology major, they have also repeatedly reflected the problem that students cannot understand the drawings. It is evident that it is extremely urgent to enhance students' ability to read and draw engineering drawings using the third-angle projection method in English. In light of this situation, we have developed a course called "English Third-Angle Projection Method Engineering Drawing Reading and Drawing" to meet the needs of European, American, Japanese, South Korean, and Taiwan-funded enterprises in the Suzhou area. This course focuses on introducing the basic knowledge of the third-angle projection method, the basic knowledge of foreign engineering drawing, and American drawing standards, etc. Through the study of this course, students will be able to understand and draw English third-angle projection engineering drawings for moderately complex parts.

2 Problems found in traditional teaching

In the traditional teaching of engineering drawing courses based on the third-angle projection method in English, the main approach adopted is the lecture method where the teacher lectures and the students listen. This method mainly has the following deficiencies.

2.1 Students' enthusiasm for learning is not high

During the class, the teacher merely lectured and the students merely accepted. Although there was a question-and-answer session, it failed to form a continuous and effective interaction between the teacher and the students. Teaching is centered on the teacher, with students in a passive position. Their enthusiasm for learning is not high, and the classroom atmosphere is very dull.

2.2 Weak practical application ability

Teaching focuses on imparting specific theories, while students mainly accumulate knowledge. Especially for the content in specific standards, students merely remember it but fail to understand it when facing the actual drawings. This shows that they have not developed the ability to apply it in practice during the learning process.

2.3 The evaluation is very monotonous

In the traditional teaching model, there is only a final theoretical test paper to evaluate students' learning outcomes, lacking monitoring of the entire learning process. Many students do not study seriously during the regular period and are

busy with intensive review at the end of the term, merely to pass the exams.

2.4 It is impossible to cultivate a spirit of teamwork

In the actual working process, engineering and technical personnel need to cooperate with each other to complete the work projects. However, in the traditional teaching process, students only focus on accumulating knowledge on their own and have never completed actual projects. Therefore, they generally lack teamwork spirit, are unable to cooperate with others, and find it difficult to adapt to future internships and work.

3 Project-based transformation of the course

3.1 Determine the course objectives

Through research on closely cooperating enterprises and questionnaire surveys of previous graduates, it was analyzed that the main job position of the graduates is a CNC technician. After discussion by experts and teachers of the professional guidance committee, the knowledge, ability and quality goals required for this position were finally determined as shown in Figure 1.

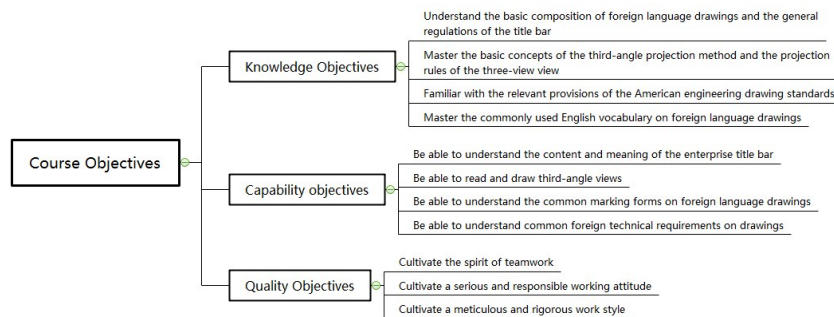


Figure 1 Course objectives

3.2 Determine the teaching projects

After the course objectives were determined, when arranging the specific teaching content, it was also necessary to consider the typicality of the content and the logical progression of the difficulty levels. Finally, based on the specific learning characteristics of the students, the course projects as shown in Table 1 were developed.

Table 1 Teaching projects

Project Number	Project Name	Project Type
1	BLOCK SIDE GUIDE KEEPER	Typical shaft parts
2	GEARBOX ADAPTER	
3	ACCUMULATOR ADAPTER	Typical sleeve parts
4	MAGNET ARM	
5	TEMPOSONIC MAGNET BRACKET	Typical box-type parts
6	RUNNER BLOCK LOCKING PLATE	
7	TIEBAR SHORT	Typical gear parts
8	PINION TIE BAR	
9	STEEPLE INBOARD	Typical assembly components
10	PLATEN INBOARD	

All the items in the table are based on real enterprise English third-angle projection engineering drawings. The content covers the part drawings and assembly drawings of common parts types encountered by CNC technicians in their job positions, and is typical and extensive. The sequence arrangement follows the principle of progressing from easy to difficult, step by step, with the required knowledge and abilities gradually increasing, which conforms to the cognitive law.

The content arrangement of each project is shown in Figure 2. The horizontal axis is carried out completely in accordance with the real working process, from understanding the title bar to understanding the view and then to understanding the annotations, which is in line with the actual working situation. The difficulty of the vertical coordinate work increases step by step, which is in line with the learning characteristics of students.

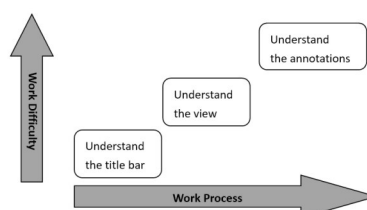


Figure 2 Project content arrangement

3.3 Implementation of teaching projects

When implementing a teaching project, the teacher first introduces the background information of the project. Then, the students form a working team. Through collective discussion, they study the project drawings following the working process from understanding the title bar to understanding the views and then to understanding the annotations. Eventually, they form a research report, make a ppt and present it to the whole class. The teacher asks questions about the presentation process and the students respond. After all teams have completed their reports, the teacher will provide comments, supplement relevant knowledge and summarize.

During the team's work process, the role-playing method was fully adopted. Since the completion of each project needs to be broken down into several small tasks, every student needs to play the roles of shape designer, precision designer, process designer and draftsman, etc., and play their respective due roles in completing the tasks. Almost the entire learning process is designed and implemented by the students themselves. Through this implementation process, a student-centered teaching process is constructed. To truly establish teaching on the basis of students' autonomous learning and active exploration, it will be conducive to creating a learning atmosphere where students love learning, and can effectively cultivate students' planning, organizational abilities and teamwork spirit.

3.4 Conduct teaching evaluations

Teaching evaluation has changed the previous model where only teachers gave scores. The final score is composed of three parts: self-evaluation by students, mutual evaluation among teams, and evaluation by teachers. Students' performance is comprehensively evaluated based on their mastery of knowledge, project completion, teamwork, attitude towards study and work, presentation performance, and defense during the presentation. The composition of grades is more diverse and the evaluation is more objective. Self-assessment by students. Students themselves evaluate the learning process based on their mastery of knowledge, project completion, etc., which accounts for 20% of the score. Team mutual evaluation. Team members evaluate each other based on the team's collaboration, which accounts for 30% of the total score. Teacher evaluation. A comprehensive evaluation will be conducted based on the student's attitude towards study and work, the completion of the project, the performance during the presentation, and the defense situation during the presentation, combined with self-assessment by the student and mutual assessment within the team, accounting for 50% of the total score

4 Emphasis should be placed on the teaching of the third-angle projection method

Drawings are the language for communication among engineering and technical personnel. China's mechanical drawing standards clearly stipulate that the first-angle projection method should be adopted for drawing, while in today's developed countries abroad, the third-angle projection method is mainly used for drawing. There are many foreign-funded enterprises in the Suzhou area. After our school students enter these enterprises for internships, many of the drawings they come into contact with are English third-angle projection engineering drawings. The difference in projection methods directly leads to the inability to understand the views. Based on this situation, in the teaching of the English course on reading and drawing engineering drawings using the third-angle projection method, I particularly emphasized the teaching of the third-angle projection method.

4.1 Let's talk about the concept of the third Angle from the perspective of the view formation process

Take the first corner as an example to first explain how the view is formed, using multimedia animation demonstration. The process is shown in Figure 3.

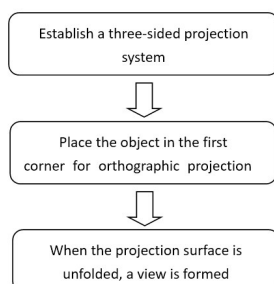


Figure 3 The first corner presents the three-view demonstration process

Then, ask the students to analyze the three views of the third Angle according to the above process, and then summarize the projection rules by themselves.

4.2 Let's explain the configuration rules of the third-angle view from the perspective of the basic view

Still using the method of multimedia animation demonstration, taking the first corner as an example, the three-sided projection system was expanded to the six-sided projection system, and the basic view was obtained. Then, ask the

students to analyze the basic view of the third corner according to the above process, and then summarize the configuration rules of the third corner view by themselves, as shown in Figure 4.

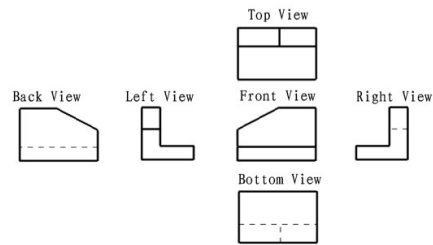


Figure 4 The basic view configuration and name of the third-angle projection method

4.3 The projection mode marking is explained from the perspective of the configuration rules of the third-angle view

In the engineering drawings of the third-angle projection method in English, projection marks are usually used to illustrate the projection method, as shown in Figure 5.

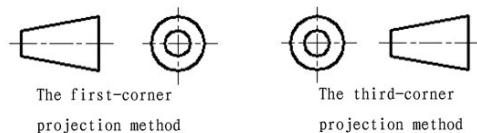


Figure 5 Projection mode marking

Because these two marks are very similar in form, students can easily confuse them. In my teaching, I adopted the configuration rule of the third-angle view as a memory method and added the truncum as a reference point, as shown in Figure 6. Then, students could master it more easily.

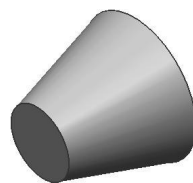


Figure 6 The circular platform is used as a reference object

5 Conclusion

The course of Reading and drawing engineering drawings using the third-angle projection method in English is set up to meet the demands of foreign-funded enterprises in the Suzhou area. Its teaching effect directly affects students' employment competitiveness and job adaptability. Through project-based transformation of it, a teaching process centered on students and with students' autonomous learning as the main body has been constructed. This teaching process not only focuses on students' mastery of knowledge, but also emphasizes the cultivation of professional qualities and teamwork abilities. By establishing a diverse and objective teaching evaluation system, the learning situation of students has been better reflected. Through teaching practice, the reformed curriculum has effectively enhanced teaching effectiveness, and students' comprehensive abilities have significantly improved.

Funding

The numerical control machining process design of slider inserts (NO: SIHT2025006789)

About the Author

Chunlei Li, master, lecturer, mainly engaged in teaching and research of advanced manufacturing technology.

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