The Research on the Application of SolidWorks in Professional Teaching

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Abstract—SolidWorks design software applied to the teaching of "mechanical drawing" course can solve the problem of small number of teaching models, inconvenient to carry, and can also promote the improvement of teaching methods of this course. Through the teaching application of the software, teachers can fully take into account the students' different personality in the teaching, and mobilize the students' learning enthusiasm and innovative interest. The initial teaching practice proves that SolidWorks design software is feasible and effective in the teaching of "Mechanical Cartography" course, and there is still room for further reference and expansion in other professional course teaching.

Keywords—SolidWorks, Professional teaching, Course on Mechanical Cartography, Study

I. INTRODUCTION

"Mechanical Drawing" is a professional basic course for mechanical majors in educational institutions. The pattern is called "the language of the engineering community" and has a great influence on students' learning of other professional courses. However, there is a widespread phenomenon in many institutions of education where teachers are hard to teach and students are hard to learn and have poor results. There are three reasons for this: First, some teachers follow the traditional teaching methods, emphasizing theory, ignoring practice, lack of initiative and lack of interest in learning; Second, although most teachers use multimedia(such as playing pictures, animations) or physical model teaching to help students establish three-dimensional space, the presentation method is mostly fixed, and it is inconvenient to change as needed; Third, most of the students have a weak foundation, weak spatial imagination and spatial thinking ability, and it is difficult to switch between two-dimensional and three-dimensional, resulting in a loss of interest in "profound and boring" drawing classes. How to stimulate students' interest in learning and improve the quality of teaching has become a difficult problem for educators in Mechanical Cartography. With the advantage of software mapping, the use of software assisted teaching has gradually become a trend. For example, SolidWorks software is a three-dimensional entity modeling software based on the Windows system environment. It has powerful physical construction functions, and is convenient, fast, intuitive, and easy to learn and use. The application of SolidWorks software to teaching, further development and practice is one of our new ideas in professional teaching reform.

II. PROBLEMS ENCOUNTERED IN THE COURSE OF TEACHING "MECHANICAL DRAWING" AND PRELIMINARY ATTEMPTS TO SOLVE THEM

Although "mechanical drawing" is an "ancient" traditional course, this course is an important basic course for the field of mechanical engineering. However, it is indeed not easy to teach this course properly. Students must do a lot of observation, thinking and practice to learn this course well. The teaching place of the "Mechanical Cartography" course is usually an ordinary classroom. The outstanding problem in the teaching process is that the number of teaching models is too small, the model is too large to carry, and it is difficult to accommodate all the students in the teaching perspective, and the students 'learning process is very passive. In order to achieve better teaching and learning goals, teaching reform is the first thing. In 2017, the author taught the course "Mechanical Cartography". The difficulty and focus of the course is to cultivate and train the student's brain to transform and correctly express the two-and three-dimensional thinking. Therefore, it is very necessary for each student to conduct a large number of, repeated, careful, long-term, and personalized observations, analysis, and discussion of the model. Based on the above, we apply SolidWorks design software to the teaching of "Mechanical Cartography." From the perspective of teaching effectiveness and student evaluation, although the teaching venue is an ordinary classroom with a projector, the students lack some initiative in the learning process. But this initial exploration is successful, and this road is worth walking.

III. FURTHER ANALYSIS AND DISCUSSION OF PROBLEMS AND SOLUTIONS IN TEACHING

Two-dimensional and three-dimensional thinking transformation and correct expression training for entities. By visualizing the space of the physical model and observing the results of different angles, two-dimensional graphics are expressed in the manner prescribed by mechanical drawing. This is called three-dimensional conversion of two-dimensional thinking training. The use of mechanical drawing rules to visualize the two-dimensional representation of a spatial entity and form the spatial shape of the entity in the brain. This is called two-dimensional conversion three-dimensional thinking training. The former mainly corresponds to the basis of mechanical engineering design, because engineers should first imagine its spatial structure when designing a certain part and express it correctly on the design diagram. The latter is the basis for digesting technical data and learning research, because engineers must first imagine the spatial structure of parts based on a design diagram expressed in a two-dimensional manner. In the teaching of "mechanical drawing", the training of students in three-dimensional and two-dimensional concept conversion should be carried out at the same time in both positive and negative aspects, and they
should promote each other gradually. The conversion of three-dimensional and two-dimensional concepts into each other in the brain is like a "kung fu" that must be mastered with a lot of hard training. Since this kind of training has both three-dimensional intuition and two-dimensional abstraction and relevance, it is necessary to rely on the physical model library to cooperate with teaching.

Problems in the Application of Teaching Model. The relationship between the teaching model and the real parts should be a gradual transition from simple to complex, from rational to practical. This process is long and difficult in learning. This "gradual transition process" usually requires hundreds of models to satisfy, but this can not be done in the usual teaching process. In general, dozens of wooden or plastic models are used in teaching. Although this traditional teaching method has a strong sense of "seeing and touching" three-dimensional, dozens of models are already in the classroom. A lot of, not to mention hundreds of? How can the same model students be observed and studied one by one? Therefore, the problem with traditional teaching methods is that due to the contradiction between the volume and the number of models, the number of models used in teaching is far from the actual needs, and there are students staring at a model or everyone in the classroom. The situation of the model. This results in low learning efficiency and the inability to take into account differences in student acceptance. In addition, the complete set of teaching models sold on the market now focuses on simple basic spatial bodies, that is, there are models available in the early stages of teaching, and it is inevitable that there will be problems of cavitation in the future. This leads to the problem of difficulty, slow learning, seeming to understand, and weak professional foundation when students study the "Mechanical Cartography" course. It can be seen that traditional teaching AIDS have restricted the reform of teaching methods, and the problem of teaching AIDS has become a bottleneck. Given the importance of the mechanical mapping course and the heavy and time-sensitive nature of the teaching task, how to solve the problem of models through innovation has become a top priority.

Dialectical Unity of Solving Common Problems and Solving Individual Problems in Teaching Solving common problems is always the focus of teaching reform, but to a certain extent common and individual are contradictory. If we want to further improve teaching effect and teaching efficiency, we must make breakthroughs in the reconciliation and solution of this pair of contradictions, and we need to further strengthen the consideration of students' personality differences in the teaching process; Strengthen the student's initiative, innovation and achievement in the learning process; Strengthen the students' learning methods and knowledge development. Due to the long-term existence of traditional teaching methods using the physical model alone, it is difficult to achieve a breakthrough in solving the above problems.

Feasibility of Application of SolidWorks Design Software in Teaching. SolidWorks design software and the effective application of multimedia classroom in the teaching process of Mechanical Cartography provide a basic idea and conditions for solving problems. This idea is to use SolidWorks to design software to solve the problem of the model, use multimedia classrooms to solve personalized teaching as an entry point, and thus derive a reform in the teaching method of the "mechanical drawing" course. SolidWorks based design software has free modeling and strong stereoscopic effects, free rotation observation, multi-directional observation, diversification of physical display styles, arbitrary entity cutting, automatic generation of physical three-view, virtual assembly and animation generation, virtual operation and other functions. This makes it possible to make secondary development and application in the course of professional teaching. The use of multimedia teaching environment in teaching can greatly reduce the dependence on physical teaching aids, and can greatly increase the flexibility, diversity, and individuality of teaching processes. It can greatly enrich the teaching model library. At the same time, each student can use his imagination and creativity to freely design his own model according to his own needs and interests, and thus eliminate the fear of the student's "mechanical drawing" course and increase the interest and achievement in learning. Therefore, SolidWorks design software has the characteristics of virtualization, flexibility, personalization, and diversification of functions, so that it can not only be applied to the design and technical analysis of mechanical engineering in enterprises, but also can be applied to the teaching of professional courses in teaching. It even conducts technical analysis and innovation training for industrial cases, and thus runs through the students 'learning and employment, making them a powerful assistant for the sustainable development of the students' career.

IV. APPLICATION OF SOLIDWORKS DESIGN SOFTWARE TO TEACHING PRACTICE OF MECHANICAL DRAWING COURSE

Teachers use the model library of the teacher's machine to conduct a unified explanation according to the teaching plan. The students each pull out the model to further observe and understand freely. The students put forward questions and teachers 'answers. The students do classroom exercises and use SolidWorks design software to assist, encouraging the students to use their own creativity and imagination. Set up its own model base to further analyze research and exchange learning. The following is an example of the application of SolidWorks design software in the teaching of Mechanical Cartography.

The concept of projection. In the practice of cartography teaching, the cartography class abstracted the original intuitive object from three-dimensional to two-dimensional plane. Student learning is an abstract environment and can not effectively develop and improve students' spatial imagination. Solidworks software three-dimensional spatial mapping function can solve this problem. In software three-dimensional spatial mapping, students can observe three-dimensional entities from various angles, and can better understand the theoretical knowledge and practical knowledge of mechanical drawings such as crossover, in intersection, and assembly.

Cross and Intersection Lines. It is a difficult point for students to analyze the intersection line of stereo surface intersection line by using Solidworks. Using Solidworks drawing, students can visually see the intersection line and its projection on each side. As in Figure 2(a), fill the left view. Many students do not know where to start. The intersection of the two columns is in which direction to bend. Add the circular holes one by one, so that the difficulties are broken down and explained at each step.
Students can understand and know how to think about such questions. Use the Solidworks analysis group to visualize the three-dimensional shape based on known views and fill in the missing lines in the diagram. Such questions may have multiple answers. Using Solidworks to express the answers that students think of is beneficial to students’ imagination. The combination is a combination of multiple basic body cuts or combinations. Using Solidworks to draw the basic body first, and then combine, each student's disassembly method is different, and each method is expressed in class, which is conducive to cultivating students' divergent thinking ability.

Expression of part drawings. In the production of real products, the shapes of the parts are diverse. The basic view expresses the external shape, but it does not express the internal shape well. The solid line in the mechanical drawing represents the visible part, and the dotted line represents the invisible part. If the internal structure of the parts is more complex, there are more dotted lines on the drawings, and sometimes these dotted lines coincide with the outer outline real lines. The solution to this problem is to use various sections of views and broken maps in the mechanical drawing regulations, which makes it more difficult for students to read and draw pictures. The use of Solidworks software to draw stereoscopic graphics can solve this problem. In the finished parts, the parts are arbitrarily cut with software, and the opposite is colored. The three-button mouse moves the rotating parts map at will, allowing students to make the shape of the parts clear in the dynamic demonstration. Makes the structure of complex parts easier to understand.

V. CONCLUSION

The application of SolidWorks design software in professional teaching can not only solve model problems in a new way, but also bring about changes in teaching methods. Facing students with different levels, teachers should update their teaching methods and change their traditional teaching methods. For example, in the teaching process, they should give full play to the directness and flexibility of Solidworks three-dimensional software, and improve the enthusiasm and initiative of students in learning. It has been proved that using this software to assist teaching, teachers will be easy to teach, students will be easy to learn, teaching results have also been significantly improved, and students have learned and familiar with the three-dimensional software earlier, laying a solid foundation for future development.

REFERENCES