

Teaching Reform of Engineering Drawing Course Against the Background of Emerging Engineering Education

Wenfang Zhang, Qingchun Hu

Hunan City University, Yiyang, 413000, China

E-mail: zwfxc1016@163.com

Keywords: Emerging engineering education, Engineering drawing, Teaching reform

Abstract: Based on the background and goal of emerging engineering education, In view of the local colleges and universities-Hunan City University. with the course of “engineering drawing” as an example, Compared with the graduation requirements of the Engineering Education Accreditation. In this paper, the problems with the course of Engineering drawing are analyzed. some reforms have been made from the aspects of curriculum system, teaching content, teaching methods and assessment methods, etc. In order to promote the continuous improvement of the teaching quality of course entitled Engineering drawing, further studies on how to establish the new teaching mode which can meet professional certification standards are called for.

1. Introduction

Emerging Engineering Education is a new idea for engineering education reform proposed by the Ministry of Education in response to major strategies such as “Made in China 2025” and “Internet +”. It focuses on the development of new technology industries in the future and builds new ideas, new structures, new quality and new systems for engineering education. Emerging Engineering Education is the direction of my country's engineering education reform based on the new needs of national strategic development, the new situation of international competition, and the new requirements of establishing morality.

Emerging engineering education is one of majors aimed at emerging industries, such as artificial intelligence, intelligent manufacturing, etc. the other is the upgrading and transformation of traditional engineering majors. Building a new engineering discipline does not mean blindly adding emerging engineering education disciplines. It should pay more attention to the reform of traditional engineering disciplines. It provides an important foundation for the construction of emerging engineering education.

2. Problems with Traditional Teaching

As a professional basic course for engineering majors, engineering drawing aims at cultivating students' spatial thinking ability, drawing, and enhancing students' engineering practice ability and

innovation consciousness. The learning process of engineering drawing is a complex cognitive process, requiring students to quickly accept, process, recognize and apply engineering drawings that contain invisible entity information under the constraints of relevant norms and standards. The teaching process of engineering drawing is to help students gradually enhance their cognitive ability of drawing.

2.1 Single Method of Teaching and Assessment

A series of problems have emerged in the teaching method of engineering drawing: the classroom is mainly taught by the teacher actively, and the students passively accept it. There are more “low-headed people” in the classroom, which does not conform to the “student-centered” concept of the new engineering discipline; hand-painted several engineering drawings As a standard to test the effectiveness of the classroom, it is time-consuming and inefficient. It cannot keep up with the pace of the computer-aided design (CAD) era. It is also contrary to the original intention of new engineering to emphasize practice. After finishing the course, students enter the course design or graduation design link, drawing practice Lack of ability.

2.2 Poor Self-Learning Ability of Students

Contemporary college students have an active mind, a strong thirst for knowledge, and a strong desire for expression. They have a low sense of identity with the traditional teaching model taught by students and are eager to interact with teachers. This is beneficial for cultivating students' questioning spirit and innovative consciousness Elements.

Most schools of engineering drawing courses put it in the first semester of freshman year. Students have just graduated from high school and do not have the pre-knowledge required for this course. Such as spatial thinking ability, engineering awareness and other theoretical knowledge and practical ability, students cannot distinguish the characteristics of this course in their study, and treat this course as a course similar to advanced mathematics and physics. The professional foundation of students is relatively weak, and their spatial imagination abilities are different. This requires a combination of “online + offline” and “pre-class + in-class + after-class” based on the differences in individualization of students. Mixed teaching mode to improve students' autonomous learning ability.

2.3 Poor Spatial Imagination of Students

The training of spatial imagination ability is the key and difficult point in the teaching link of engineering drawing course. The engineering drawing course has higher requirements for students' spatial imagination ability, requiring students to be able to imagine a plan based on a physical model, and a physical model from the plan.

In actual teaching, due to the inappropriate teaching methods and teaching methods, coupled with the fact that students are exposed to fewer objects and models, and lack of engineering practice experience, it restricts students' understanding of graphics and results in students' ability to think in images and space imagination. Poor, it is difficult to realize the conversion between real objects and graphics.

3. Contents of Reform

3.1 Reform of Teaching Content

The teaching content of traditional engineering drawing is based on the theory of descriptive geometry, focusing on projection methods and basic theories.

With the development of computer CAD technology, computer drawing technology gradually tends to improve, and two-dimensional drawing and three-dimensional modeling software are widely used in production practice. In the design of teaching content, the key and difficult knowledge points in the teaching content of engineering drawing are organically integrated with CAD three-dimensional solid modeling, which not only reduces the difficulty of teaching, but also improves students' interest in learning and cultivates students' spatial imagination ability And creative conception ability. For example, after explaining the projection theory, add the teaching content of CAD plane drawing commands and editing commands, so that the two can penetrate each other and integrate organically. Figure 1 is an assembly drawing of a carbon-free car drawn by students.

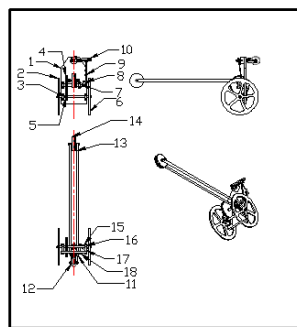


Fig.1 Carbon-Free Car

3.2 Reform of Teaching Mode

Make full use of the online teaching platform to reform the teaching mode and solve the problems of large teaching content and insufficient teaching hours. The online teaching platform of this course is constructed with the help of “zhihuishu”. A wealth of online electronic resources have been uploaded in the teaching resources column, including five columns, including pre-class preview, teaching courseware, electronic teaching plans, micro-classes, and after-class development divided by knowledge points.

By adopting a blended teaching model and combining online and offline, the students' fragmented time is fully utilized, and the time for independent learning is significantly increased. Difficulties and doubts in the learning process are also solved in time, and the understanding of the course content is also improved. In-depth, there are also abundant network resources as an aid to review the course knowledge points and content in a timely and clear manner. The design of the course network teaching platform is shown in Figure 2.

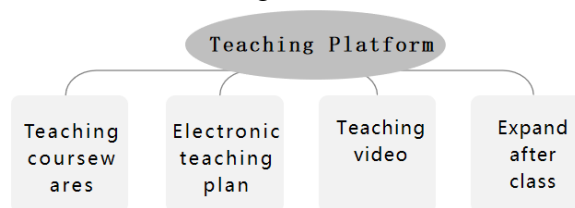


Fig.2 Design of Network Teaching Platform

3.3 Reform of Assessment Methods

The new assessment method highlights the main line of “engineering ability training”, and

strengthens the assessment mode of “process + result” and “knowledge + ability” to adapt the teaching of engineering drawing to the goals of changing majors and social needs.

Engineering education certification focuses on the training of students' abilities. Engineering drawing is a very practical and applied course, and the results of a single final exam paper can hardly reflect the real results of students. After years of exploration, combined with the characteristics of the course and the teaching goal of “cultivating drawing and drawing ability”, the assessment method adopts the multiple comprehensive assessment methods of “online + offline” and “before class + in class + after class”, and Set the weight coefficient according to the importance of each assessment content.

3.4 Teaching Team Building

Any teaching reforms are implemented by front-line teachers. The teaching team is a form of organization that relies on a certain course or several related courses, has a leader as a link, and brings together teachers with a common purpose and vision. Long-term teaching practice has proved that building a teaching team that is united, cooperative, actively exploring, and brave in innovation is an important foundation for the completion of various educational reforms, and it is also a guarantee for the smooth progress of the construction of new engineering. The innovative personnel training mode is shown in Figure 3.



Fig.3 Innovative Personnel Training Mode

The teaching team combines teaching and engineering practice to build an innovative talent training system that integrates teaching, scientific research and innovation. The latest achievements of scientific research are integrated into textbooks to promote classroom teaching, innovative experiments, engineering design and scientific research projects. The innovative practical teaching system transforms scientific research into teaching advantages and realizes the mutual benefit of teaching and research.

While the students are in school, the team teachers combine their own scientific research directions to give targeted topics to the students of their majors, and to guide them, and absorb students to participate in the scientific research topics and projects they preside, and provide targeted guidance and training to the students.

The students guided by the team members have won awards in the Hunan University Student Mechanical Innovation Competition and the University Student Challenge Cup competition many times.

4. Conclusions

This curriculum reform pays attention to the integration of disciplines, conducts teaching design

for majors, focuses on cultivating students' innovation ability, and makes a bold attempt for the upgrading of traditional basic curriculum, and has achieved initial results. Figure 4 shows the distribution of student scores, and their performance has improved significantly.

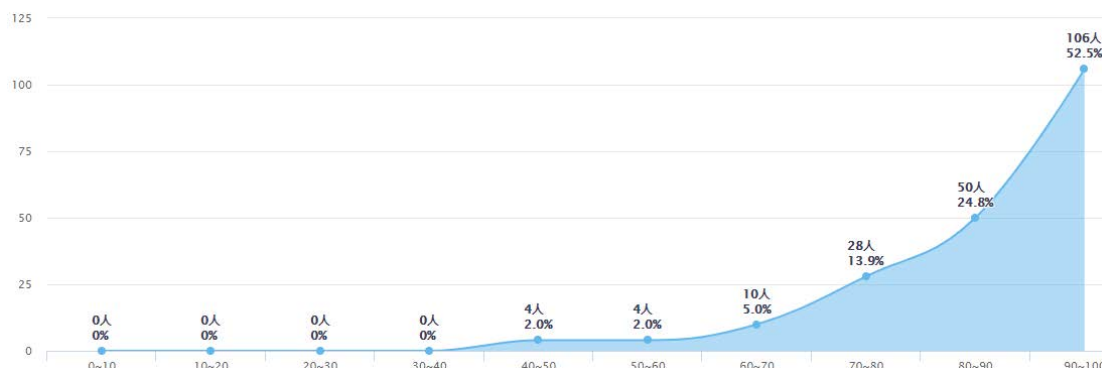


Fig.4 Score Distribution

Under the background of emerging engineering education, new contents and requirements appear in engineering drawing course teaching, which puts forward a severe test to the traditional teaching methods and means. emerging engineering education has put forward new requirements for engineering education, not only in the renewal of training ideas, but also in the realization of talents trained to meet the needs of today's world.

Funding: This research was funded by Teaching Reform Research Project of Education Department of Hunan Province (grant number 2017383).

References

- [1] Department of Higher Education. Emerging engineering education construction guide. *Research in Higher Education of Engineering*, 2017(4):20-21.
- [2] http://www.moe.gov.cn/s78/A08/tongzhi/201702/t20170223_297158.html.
- [3] "Emerging engineering education" Construction of Fudan Consensus. http://www.moe.gov.cn/s78/A08/moe_745/201702/t20170223_297122.html.
- [4] YANG Li, HAO Yuxin, LIU Lingtao. On the Teaching Reform of Engineering Graphics in the Context of Engineering Education Accreditation. *Journal of Graphics*, 2018(08).
- [5] http://cn.ceeaa.org.cn/news.php?news_id=79.
- [6] Lee N, Dossick C S, Foley S P. Guideline for building information modeling in construction engineering and management education [J]. *Journal of Professional Issues in Engineering Education and Practice*, 2013, 139(4):266-274.
- [7] LUAN Ying-yan, WANG Ying, HE Rui. Course reform of engineering graphics against the background of emerging engineering education. *Journal of Graphics*, 2020(02).
- [8] MU Haozhi. The Design and Teaching of Basic Mechanical Courses Based on Specialized Accreditation of Engineerin. *China Education of Light Industry*, 2015, (5): 66-70.
- [9] SUN Weihong. Teaching Reform Practice of "Language" Teaching Mode in Engineering Graphics. *China University Teaching*, 2015(3): 59-61.
- [10] WANG Huaibo. A Study on the Differences in Behaviors of Deep and Shallow Learners in College Blended Teaching. *e-Education Research*, 2017(12): 44-49.
- [11] YANG Shu ming, LIANG Bing, WANG Chang hua. A Research on Teaching Reform of Civil Engineering Drawing Based on Mixed Teaching Concept. *Journal of Higher Education Research*, 2017(1): 94-97.