

# Discussion and Practice on teaching reform of steel structure design course in Colleges and Universities

Huijuan Yang

Ningxia Construction Vocational and Technical College, Yinchuan, Ningxia, 750021

**Abstract:** the main purpose of the course “steel structure design” is to enable students to master the methods and means of steel structure design and cultivate engineering practice ability. With the proposal of the “three education” reform concept, this paper analyzes the effective measures of domestic colleges and universities in the reform of steel structure course, and analyzes the shortcomings of the current teaching of steel structure design course in Colleges and universities. According to the nature of the course, the teaching reform methods and measures of steel structure design course are actively explored from the perspectives of integrating subject knowledge and interdisciplinary research.

**Key words:** colleges and universities; Steel structure design course; School enterprise cooperation

**Introduction:** the course of steel structure design is the core content of structural design for undergraduate students. The course of steel structure design mainly teaches the materials, structural forms, design theory and design methods of single-layer portal frame, heavy plant, multi-storey and high-rise steel structures and large-span steel structures. The content of the course covers a wide range and depth, and it is practical and difficult to teach. In order to enable students to better grasp the knowledge of steel structure design course, cultivate applied talents with solid foundation, strong engineering practice ability and the ability to solve practical engineering problems, colleges and universities need to face up to the shortcomings in the teaching of steel structure design course, further promote teaching reform and comprehensively improve the teaching quality of the course. Based on this, this paper analyzes the existing problems in the teaching of steel structure design, and puts forward the corresponding reform strategies.

## 1 Problems in the teaching of steel structure design in Colleges and Universities

### 1. the curriculum is old and does not meet the needs of industrial design

At this stage, the teaching mode of steel structure design course in major colleges and universities is stereotyped and has no characteristics. The design concept is old-fashioned, which is far from meeting the personalized needs of customers and the development of diversified culture under the condition of market economy. For example, the unchanged course design of steel roof truss, from the time when teachers went to school more than 20 years ago to the time when students are taught now, It has hardly changed. In addition, in the teaching of some basic knowledge and elective content, some teachers will not force students to pay enough attention to relevant courses, but only take full credits as the standard of learning. The result is that the students’ design thinking is always confined to the traditional design concept, and the designed works are more than flowery and lack of practicability. Some are even unconstrained, completely out of design standards, just to cope with homework.

### 2. theoretical teaching is out of touch, hindering practical work

At present, although some colleges and universities have realized the necessity of implementing the integration of theory and practice teaching, they have launched a series of explorations in this regard. However, from the perspective of teaching ideas, the teaching of steel structure design still shows an obvious tendency of emphasizing theory and ignoring practice. Teachers and students still put their main teaching and learning energy on theoretical learning, and neither thought nor behavior has really realized the “integration of theory and practice”. Therefore, in the daily teaching of steel structure design course, some teachers do not pay attention to the organization and development of practical activities, which leads to the serious disconnection between theoretical teaching and practical teaching. For example, although many students have mastered the basic principles of steel structure design, they have not made corresponding models; Although some students have carried out the corresponding action operation practice, the works designed by them are only similar in shape, and their quality is difficult to meet the actual production needs.

### 3. separation of “theory” and “reality”

With the implementation of the enrollment expansion policy, the scale of higher education is expanding day by day. The direct result of the rapid development is the original practice teaching base, which is difficult to meet the existing practice teaching needs. In addition, some colleges and universities have not built practical teaching places with practical functions due to their limitations in financial, material and spatial layout. Even though some colleges and universities have corresponding training venues and equipped with certain training equipment, most of the venues and equipment also have a series of problems, such as unreasonable configuration, outdated equipment, and inadequate management. Although some of the training venues can meet the basic needs of practical teaching, they still need to be further improved in terms of practical environment. It is difficult for students to get sufficient practice and exercise from them, which makes it difficult for practical teaching to achieve the desired effect. In school enterprise cooperation, some enterprises are not willing to provide sufficient training venues for schools for safety and other reasons.

### 4. teachers are busy teaching and students are hard to concentrate

The continuous updating of steel structure design concept and the rapid development of design technology have brought new challenges to the teaching of steel structure design. In the face of heavy teaching and research tasks, some teachers gradually show that they are not willing to work hard. They not only have no energy to learn new ideas and technologies, but also have no spare time to participate in training in enterprises. How can they adapt to the continuous innovation of education and teaching mode under the background of higher education reform? From the perspective

of students, due to their busy schoolwork, the learning requirements of each subject are not the same. In addition, some colleges and universities are unreasonable in the curriculum itself, which makes students exhausted and hard to concentrate on in-depth study and research of each course; Moreover, because some students do not know how to plan their time reasonably, most of their after-school time is spent on playing games and participating in unimportant community activities, resulting in unsatisfactory learning effect.

## 2 Teaching reform of steel structure design in Colleges and Universities

### 1. integrate subject knowledge and enrich the connotation of talent cultivation

Professor huangxinyuan of Communication University of China pointed out: “in the field of design, we need the deep integration of art and technology. But in the process of the integration of the two, we need to make it clear that technology always serves art.” Therefore, the teaching reform of steel structure design should carry out the “succession” of art and technology on the basis of clarifying the subordinate position of art and technology.

The teaching design of the course “steel structure design” which is “work for use and art oriented” can organically integrate the two disciplines. On the basis of cultivating students’ engineering thinking and helping students consolidate engineering knowledge, it can guide students to more systematically and completely express the design idea and present the design intention with the logical way and creative means of artistic design. In the teaching process of steel structure design course, it is necessary to cultivate students’ engineering thinking through the teaching of engineering knowledge unit, and promote the improvement of students’ steel structure design thinking and logic by combining the expression methods, expression means and expression language of design, and describe it in a visual way. In the specific teaching practice, it is necessary to connect the completion of teaching tasks, scientific research tasks and students’ social practice by introducing the real practice project of steel structure design, so as to realize the collaborative promotion of teaching tasks, scientific research tasks, production tasks and talent training tasks, and strengthen the connotation of talent training in this process.

### 2. improve the effectiveness of practical teaching by relying on the engineering training system

Under the background of the new era, the main purpose of constructing engineering training module in the teaching of steel structure design is to meet the personalized needs of students. In this regard, in the process of teaching reform of steel structure design, the engineering training system of steel structure design can be built around the design and development of actual projects, so that students can experience the practice process of investigation, measurement, analysis of site environment, selection of building materials, application of construction technology, process management and so on, so as to realize the systematization and modularization of practical skills training. In the process of practice, students need to go deep into the project site, and teachers conduct on-site teaching, and carry out discussion and communication around the actual problems of the project, so as to help students construct professional knowledge system. In the engineering training of the course of steel structure design, many training modules are connected in series with actual engineering projects, and the teaching content is presented concretely. Then the specific project tasks are clearly divided, and finally a summary report is formed, which lays the foundation for the practice of the course of steel structure design from the aspects of content, methods and means.

Productivity is a typical feature of the course of steel structure design. In the teaching reform of steel structure design, school enterprise cooperation is also an important way to cultivate students’ practical ability. However, the further promotion of school enterprise cooperation needs to mobilize the enthusiasm of enterprises to participate in talent training, which is the key and foundation of school enterprise cooperation and has a direct impact on the productive requirements provided by enterprises. At the same time, the productive requirements of steel structure design also require that the works or achievements designed by students in practice should be able to meet people’s basic use needs and contribute to the construction of an ecological and livable environment. One of the main social services of the steel structure design industry is the construction and design of engineering projects. Therefore, in the process of teaching reform of steel structure design course in Colleges and universities, the organization and design of engineering training module should be based on the premise of promoting the improvement of students’ practical ability and ensuring the effectiveness of practical results. Finally, guide students to integrate scientific research and innovation achievements into the project design, so as to cultivate students’ innovative thinking, lay the foundation for students’ innovation and entrepreneurship, and further improve the transformation speed of scientific research achievements to practical application.

### 3. deepen the assessment system and strengthen basic education

Under the background of the new era, the teaching reform of steel structure design course in Colleges and universities must pay more attention to the basic knowledge points. Only when students master solid professional theories can they apply their professional skills to practical project design more flexibly. Therefore, in terms of curriculum setting, schools should reasonably arrange courses and class hours according to students’ professional development needs. In the teaching process of basic theory of steel structure design, teachers can use task driven teaching method to assign corresponding design topics for students, so as to fully exercise students’ logical thinking ability and professional practice ability. In addition, in terms of teaching effect evaluation, the school needs to change the previous closed evaluation mode, and comprehensively evaluate students’ learning achievements through the innovative mode of “exhibition instead of examination”. The specific implementation scheme is as follows: in the teaching process, teachers present classic steel structure design cases at home and abroad to students on the basis of special teaching. To mobilize students’ enthusiasm to participate in practical teaching activities, expand students’ vision of steel structure design, and help students accumulate professional materials. In the course assessment stage, the teacher assigns specific design tasks to the students, requiring them to complete the tasks through independent creation or group cooperation. In the process of students’ practice and exploration of design tasks, teachers need to track and participate in the whole process, pay attention to students’ design progress and their innovative ability and creative attitude in the design, and after students’ design tasks are completed, the students’ works will be publicly exhibited in the class for a week, and the teaching and Research Office will organize teachers from students’ aesthetic quality Design thinking, practical skills and daily learning performance, and conduct

a comprehensive evaluation of students to ensure the fairness of the evaluation and assessment.

#### 4. comprehensively promote the reform of “three educations” and build a “double qualified” teaching team

Teachers, teaching materials and teaching methods are the foundation of the teaching of steel structure design. In the process of further promoting the teaching reform of the course of steel structure design, efforts should be made to build a “double qualified” teaching team, introduce highly educated talents with enterprise work experience, or encourage existing teachers to take temporary posts in enterprises for training; Optimize the teacher qualification system, and strengthen the proportion of professional teaching and practical requirements in the evaluation of excellence, so as to comprehensively improve the professional quality of teachers; At the same time, technical backbones with rich practical experience can be employed as part-time teachers to guide the two-way flow and in-depth cooperation between school professional teachers and enterprise technical backbones; With quality improvement as the main line, we will further promote the reform of teaching methods, the optimization of teaching content and the construction of teaching staff of the course of steel structure design, and promote the organic combination of the teaching of the course of steel structure design and modern information technology means, as well as the integration of various new technologies, new specifications and new technologies into the teaching content of steel structure design, Improve the adaptability of steel structure design course teaching and industrial development, and comprehensively improve the training quality of steel structure design talents.

### 3 Conclusion

The teaching reform of steel structure design course in Colleges and universities is the exploration and practice of interdisciplinary and integration in Colleges and Universities under the background of the new era. In the process of teaching reform, teachers should actively optimize and combine the course units, and promote the full play of the respective values of new technologies, new norms and new ideas in the training of steel structure design talents. Combined with the system and management of engineering training, students are guided to be familiar with the process, means, technology and process management of engineering project practice, which plays a positive role in the production efficiency of the final results of design and practice, making the teaching of steel structure design become “active water”, strengthening the practical ability of talents, and meeting the current application-orientedThe characteristic demand of talent training of composite steel structure design.

### References:

- [1] Xiangsen Ouyang,Zhaofeng Liu,Jie Liu,Hongbo Zou Teaching reform of Civil Engineering Specialty under the background of engineering education certification -- Taking “steel structure design principle course” as an example [j]Intelligence, 2022 (36): 85-88
- [2] Yongbao Wang,Yunjing Nie,Xuan Zhang Teaching reform integrating college students’ structural design competition with steel structure teaching [j] Experimental technology and management, 2022,39 (10): 190-193+243
- [3] Tao Li On the teaching reform of steel structure design principle course [j]Science and technology wind, 2022 (27): 91-93
- [4] Weiqing Li Exploration on teaching practice of steel structure design course in application oriented universities [j]Science, education and culture, 2022 (16): 61-64
- [5] Lingtong Zhang,Zhen Zhang,Baoyuan Li,Chenglin He Teaching reform of concrete structure design principle for Applied Undergraduate in southern Xinjiang -- Taking the teaching reform of mechanical and Electrical Engineering College of Xinjiang Institute of technology as an example [j]Real estate world, 2022 (13): 79-81
- [6] Lingtong Zhang,Zhen Zhang,Baoyuan Li,Chenglin He Discussion on the teaching reform of “concrete structure design principle” course [j]Technology and innovation, 2022 (13): 110-112+116
- [7] Lingtong Zhang,Zhen Zhang,Baoyuan Li,Chenglin He Design and exploration of online and offline Hybrid Teaching -- Taking the course of “principles of concrete structure design” as an example [j]Science and technology wind, 2022 (16): 130-132
- [8] Zhichao Du Analysis and thinking of steel structure design principle course based on project teaching [j]Science and technology wind, 2022 (14): 91-93
- [9] Yu Zhang,Enxiang Qu Research on the reform of experimental teaching method of concrete structure design principle [j]Building materials development orientation, 2022,20 (08): 37-40
- [10] Zhanyuan Gao,Fang Yang,Huidong Zhang,Shu Yao Exploration and practice of teaching reform of steel structure design course under the background of new engineering [j]University education, 2022 (04): 83-85
- [11] Ni Zhang,Xiufeng Wu,Zhongwei Zhao,Haiqing Liu Teaching reform of steel structure design based on the cultivation of practical talents [j]Journal of higher education, 2022,8 (01): 140-143
- [12] Qiumei Gao,Yuedong Sun,Dongxia Yin Analysis on the teaching reform of concrete structure design course [j]China Equipment Engineering, 2021 (22): 236-237
- [13] Chunyang Liu,Xiuling Li,Fengmin Xia,Yuming Zhang,Yilin Wang Teaching reform and practice under the background of engineering education certification -- Taking “concrete structure design” course as an example [j]Education and teaching forum, 2021 (46): 73-76
- [14] Zhizhi Wang,Leilei Yan Research on Ideological and political teaching of product structure design course in industrial design [j]Design, 2021,34 (21): 93-95
- [15] Bing Cao,Zhen Wu,Bo Huang,Li Jiang,Yizhen Yang,Changsheng Wang,Yihan Du Teaching reform and practice of “Online + offline” course of concrete structure design principle for civil engineering specialty based on engineering education [j]Journal of Anyang Institute of technology, 2021,20 (06): 71-74
- [16] Shengchao Ma Research on teaching design reform of steel structure course for Construction Engineering Technology Specialty in Higher Vocational Colleges [j]Real estate world, 2021 (17): 33-35