Research on the Ideological Education Method of Engineering Drawing Course Based on Engineering Literacy

Qing LIU
Shandong Institute of Petroleum and Chemical Technology, College of Mechanical and Control Engineering

Abstract: “Engineering Drafting” is based on the drawing theory of geometric projection, with blackboard, wooden mold and mural as the medium, and ruler, circle and drawing board as the tools. In recent years, with the development of computer, network and multimedia, commercial software such as AutoCAD and SolidWorks have become the main tools for engineering drawing. Engineering drafting is a basic technical course that must be learned in engineering, and plays an important role in mastering modern engineering technology, which also includes drawing, spatial thinking, computer mapping and other functions. Engineering drawing is an indispensable technical document in production, and is the “language of engineering technology” commonly used around the world. The correct drawing and reading of engineering drawings is an important skill that technical engineers must have.

Keywords: Engineering drafting; Ideological education; Methods

DOI: 10.47297/wspiedWSP2516-250006.20200410

Engineering drafting is an important basic technical course in engineering. Ideological education in the framework of engineering drafting can effectively expand students’ understanding of the importance of the process. Determine the corresponding entry points for engineering drawing and ideological education, set teaching objectives, and realize the use of teaching contents and methods. Educate students, guide them within the curricular structure, and play a leading role in engineering drawing.

About the author: Qing LIU (1982-02) , Female, Qingzhou, Shandong, Chinese Han, Shandong Institute of Petroleum and Chemical Technology, College of Mechanical and Control Engineering, Associate Professor, Master of Engineering, Automatic control technology of electromechanical system; Research on the Teaching of Engineering Graphics.
Funded project: Research and exploration on the method of ideological and political education in the course of technical drawing based on engineering accomplishmen.
1. Current Situation of Engineering Drawing Education

With the development of education, the importance of “engineering drawing” as the main technical course in colleges and universities cannot be underestimated, and the basic techniques of engineering drawing are needed in the subsequent learning process of engineering majors. The course “Engineering Drawing” has clear basic, graphic and engineering requirements, which are different from other basic courses. The “engineering drafting”, which is the basic knowledge of engineering, is widely used. In the context of thinking about ideological education, students are given the opportunity to learn engineering drafting literacy and important ideas of ideological education by teaching “engineering drafting”. The first two years of university is an important period for shaping students’ philosophy of life and values, and the ideological education can effectively help students to establish the concept of value for both individuals and the country. The ideological education based on engineering drafting course can cultivate the basic literacy of patriotism, respect for law and socialism, understand and apply these values, and guide the students to form a healthy ideology.

2. Ideological Education Goals of Engineering Drafting Course

Different from the characteristics of engineering drawing course, the ideological education is related to the educational objectives of engineering drawing course as follows.

(1) Raising Awareness of Mechanical Engineering

To make students understand national architectural drawings, use techniques and drawing standards, and be able to apply these techniques. The way of working and the development of construction technology raises students’ awareness of the need to comply with national regulations and to implement national policies effectively.

(2) Cultivate Students’ Spatial and Logical Thinking Skills

Use projection methods and the ability to express three-dimensional spatial bodies using two-dimensional flat shapes. Conduct students to view and understand social phenomena from multiple perspectives, express their personal opinions accurately and rationally, and maintain social order.

(3) Exploit Students’ Creative Design Skills

Teachers should guide students to set reasonable goals to design creative structures, components and products for future learning to meet the needs of national industrial development and promote national industrial modernization.
(4) Increase the opportunities for students to use drawing tools

Use AutoCAD drafting software to set up the drafting environment and draw 2D graphics and 3D views for objects. The application of drafting software allows the design and drawing of new complex patterns, parts and products, further enriching the multipurpose requirements of the state.

3. Integration of Ideological Education and “Engineering Drafting” Teaching

The content and characteristics of traditional education of “Engineering Drawing” course are combined with the concept of Civic Education, and the content of Civic Education is reasonably integrated into each chapter of “Engineering Drawing” course, so that it can be naturally integrated. In different parts of the course, the following contents of political education can be introduced.

(1) Drawing Basics

Based on the national standards “Technical Drafting” and “Mechanical Drafting”, some basic terms of dimensions, widths and drawings, title bars, proportions, fonts, and others are specified, emphasizing the scientific, rational and serious nature of the relevant standards implemented by the state, raising students’ awareness of compliance with the law, emphasizing the accuracy of drawings, stressing the importance of details, and enhancing students’ attitudes to serious learning and work.

(2) Design of Two-Dimensional Shapes

Drawing basic geometric shapes, two-dimensional shapes and designing planar shapes (curved connections, drawing planar shapes using AutoCAD) need to focus on the accuracy and technicality of the shapes, promote graphic innovation, draw patriotic images and deepen students’ patriotic awareness.

(3) Projection of Points, Lines and Planes

Course content:

1) Projection of Points (tripartite projection of planes from points, relationship between point projection and Cartesian coordinates, rules of point projection, relative position of two points, determination of visibility of reshadowing points).

2) Projection of Straight Lines (characteristics of straight line projection, projection of straight lines in different positions, relative position of points and lines, relative position of two straight lines).

3) Projection of Planes (methods of displaying planes, projection characteristics
of planes, projection of planes at other positions, methods of drawing lines with plane points).

4) Relative Position Relationships between Lines and Planes, Planes and Planes (relative position determination such as parallel lines and intersecting lines).

Analyze the positional relationships and correlations between points, lines, and planes to introduce a multi-faceted understanding of the meaning of the problem, establish rules for perceiving things, from simple point, line, and projection functions to rules for three-dimensional projection, and encourage students to generate projection diagrams based on the rules.

(4) Basic Geometric Projection

The course integrates ideological education content: based on the simplicity and clarity of geometric projection analysis, the rationality of placement (the impact of location on projection), guiding students to establish a correct outlook on life, treating people honestly and facing properly their own position in society.

(5) Projection of Constructed Geometric Figures

1) Cutting Plane Geometry (projection of cones, prisms).

2) Cutting Curved Geometry (projection of cutting cylinders, spheres, combined).

3) Coherent Shapes and Projections (methods of drawing phase lines of cylinders, cones, spheres).

Contents of the comprehensive course of ideological education: Analyzing the cutting and integrating bodies themselves and the projection characteristics, making reasonable reductions according to the requirements of the part form, can enable students to understand the form of their value realization, form a reasonable view of their future study and work, and promote social harmony and stability. We design creative structures, parts and products according to the functional requirements for products to meet the needs of national industrial development and to promote the modernization of national industries.

(6) Construction and Representation of Assemblies

This section involves component composition diagrams, reading and measuring component projections. Analyze the relationship between constituent assemblages and understand the relationship between the individual and the nation by introducing the individual and the whole. Raise students’ sense of patriotism, introduce the scientific method, and talk about the norms of doing things.
(7) **Axis Measurement Diagram**

Explain the characteristics of axonometric diagrams and drawing methods, advantages (intuitive shape, easy to imagine), disadvantages (poor measurement, not a true reflection of shape and size), so that students can learn to recognize things from all directions, understand and support national laws and policies, resist one-sided perceptions, and maintain social stability.

(8) **Representation Method of Parts**

Expressing the diversity of things, helping students to understand and tolerate, expressing personal opinions accurately and reasonably, strictly following the expression of drawing in national standards, and raising students’ awareness of laws and regulations.

(9) **Standard Products**

Describe the types, specifications and technical requirements of standard parts, carefully consider the quality and maintenance costs of products, select appropriate parts, elaborate the ratio of standard products and accessories, emphasize the importance of complying with national laws and industrial standards, and develop students’ engineering literacy.

(10) **Assembly Diagram**

Explain the impact of the accuracy of collaboration on the performance of the equipment and compare the performance differences between the same equipment at home and abroad. It can effectively improve students’ patriotism and sense of responsibility. Emphasize the importance of detailed content and improve learning ability. Assist in investigations in groups to improve students’ sense of teamwork.

4. **Teaching and Methods**

Teachers should raise the standard of Civic Education course, recognize the result and meaning of combining “Engineering Drafting” course, and always focus on the education of socialists. We should promote the teaching of “Engineering Drafting” course, and at the same time, realize the concept of ideological education and personnel training. We will promote the modern educational standards of “engineering drafting” and realize the educational reform. At the same time, different teaching tools are integrated into the curriculum of engineering drafting, and different teaching methods are applied to the whole curriculum. The classroom makes full use of teaching tools such as multimedia, physical models, videos, and online courses to introduce the course content, draw on the experiences of craftsmen and typical national figures, and use history as a starting point to develop core socialist values such as patriotism, dedication, and learning. For example, in the AutoCAD 3D modeling section, students can practice creating 3D models,
sharpen their drawing skills, deepen their understanding of the drawings they make, and promote patriotic education. This method of incorporating course content into the “Engineering Drawing” course not only improves students’ drawing skills, but also their patriotism, and improves course management. Students receive a variety of flexible educational methods that create appropriate outlooks and values for students with correct political thinking, high morals and rigorous attitudes, effectively improving their overall quality.

5. Conclusion

In recent years, the engineering drawing teaching and research department of Tianjin University of Technology has done a lot of work in reforming the content and resources of engineering drafting course. This paper focuses on the characteristics of engineering drafting course and the direction of further development to guide the thinking of the course, promote the development of ideological education and help students to establish correct outlook on life, values and worldview.

Works Cited

[1] HUANG Mingqiang, LIAN Yuxin. “Problems and countermeasures of teaching reform of Civic Education in the construction course of Engineering Drafting” [J]. Guangdong Chemical Industry, 2021, 48(01): 243-44.

[2] ZHANG Zhongjie, WU Mingyuan, LIU Jiuyi, QIAN Jiasheng. “The design and practice strategy of the teaching case of the course Civic Science---Take “Engineering Drafting and AutoCAD” as an example” [J]. Journal of Hefei College (Comprehensive Edition), 2020, 37(05): 115-19.

[3] DENG Xuelian, HU Xiang, LIU Jing. “Teaching reform and practice exploration of engineering drawing from the perspective of “curriculum thinking and government” ” [J]. Education Modernization, 2020, 7(37): 76-80.