

# *Teaching Practice and Discussion on Coal Chemical Technology*

**Yinlong Xie, Honghong Yun**

*Shenmu Vocational and Technical College, Yulin 719300, Shaanxi, China*

**Keywords:** Coal Chemical Technology, Teaching Practice, Teaching Method

**Abstract:** As a core teaching course for engineering majors in coal universities, coal chemical technology is an effective link between basic chemical knowledge and practical engineering. Under the background of education reform in the new era, coal chemical technology teaching should adapt to the new standards and requirements put forward by the society. In order to meet the development needs of social application-oriented talents training, coal chemical technology teaching has always been in a stage of continuous reform and development. Based on this background, this paper discusses the innovation and practice of coal chemical technology teaching, hoping to stimulate students' internal learning interest and motivation. In the teaching direction, we should follow the trend of the times, improve the scientific research practice level of students, and lay a good foundation for cultivating social comprehensive talents.

## **1. Introduction**

The teaching reform and practice of coal chemical technology should be reformed according to the teaching characteristics of this discipline and the development characteristics of the current student employment industry. Considering the effective combination between students' professional knowledge and practical skills, students are required to master basic chemical technology professional knowledge and have certain practical operation skills. The development of chemical industry in recent years has put forward higher standards and requirements for students, which requires reform and innovation in teaching contents, teaching methods, assessment forms and other aspects from the teaching characteristics and teaching objectives. Through reasonable curriculum organization and arrangement, the social adaptability of college students can be improved.

## **2. Introduction of coal chemical technology course**

Coal Chemical Technology is a required course in coal dominated vocational colleges. In recent years, China has made great achievements in coal to oil and coal to syngas chemistry, and has built a few industrial demonstration and commercial operation equipment in the world, making the technical development level of China's coal chemical industry in the leading position in the world. For this reason, major coal mining colleges and universities have set up majors such as Coal Chemistry and Coal Chemical Technology, providing a group of excellent technical and skilled talents for China's coal industry. Coal Chemical Technology is a specialized course for chemical engineering and applied

chemistry. It is mainly based on coal chemical technology edited by Hu Haoquan and Guo Shucui. The teaching materials are designed for 80 class hours, and the main contents of this course are taught to students in a limited 32 hours, so that students have a strong interest in complex engineering and process professional knowledge, which is a challenging job.

### **3. Discussion on teaching practice of coal chemical technology**

#### **3.1. Reviewing the basic knowledge of Coal Chemistry and quickly understanding the course**

Coal Chemical Technology takes the thermal transformation of coal as the reaction mechanism, while Coal Chemistry takes the structure, properties and transformation laws of reactants as the guide. At the beginning of Coal Chemical Technology, the teacher used one class hour to review the classification of coal, coal rock and coal quality, and the molecular structure of different coal rank coals in coal chemical technology, and guide the students to review the molecular structure, aromatic fragment core, side chain and bridge structure, pyrolysis and reaction laws of different coal rank coals according to the classification, coal seam and coal quality in Coal Chemical Technology. According to the catalogue of Coal Chemical Technology, students are required to have a clear understanding of the pyrolysis or retorting reactions of different coals and the properties of products. The properties of tar and semi coke, the precipitation laws of methane and hydrogen in coal gas can be found from the structure and reaction properties of coal. In addition, starting from the law of direct liquefaction transformation of coal, students can understand that the first step of coal is also the process of coal pyrolysis and dissolution, so that they can better understand the reaction process of coal, the conversion reaction relationship between pre asphaltene of asphaltene and oil. Reviewing the basic content of Coal Chemistry can not only make students better understand, but also achieve the function of "sharpening knives without mistaking firewood".

#### **3.2. Strengthening the connection with chemistry and laying a solid foundation for learning**

Coal Chemical Technology is a process of enlarging, engineering and continuous chemical transformation of coal, so as to form a safe, stable and efficient chemical technology. These courses include Chemical Engineering Principles, Chemical Reaction Engineering, Chemical Thermodynamics, Chemical Equipment and other core courses of chemical engineering. In teaching, teachers show students advanced technologies, such as lignite solid heat carrier technology, to cultivate students' self-confidence and interest in learning. In terms of gasification and F-T synthesis, the gas composition and the heat balance effect of F-T synthesis products are mainly introduced, and the influence of various factors on the reaction is deeply understood; The functions of different reactors in indirect liquefaction of pulverized coal and their effects on products are introduced. Therefore, strengthening the connection with the core professional courses in the teaching of Coal Chemical Technology can not only enable students to better understand the development of coal chemical technology, but also enable students to understand basic knowledge, and avoid the so-called "coal chemical technology" useless theory of some students.[1]

With the help of rich classroom teaching contents of multimedia technology, in the teaching process, according to the latest progress of chemical technology, the research progress of new technology, new process, new equipment, new process, new equipment and new process related to this course should be constantly enriched in teaching, so that students can better master new knowledge and technology and expand their knowledge. The introduction of these new materials has not only broadened students' horizons and broadened their thinking, but also provided them with a platform for employment, greatly stimulated their enthusiasm for learning, and made their learning more active. Using the multimedia technology of sound light interaction and combination of dynamic

and static, students get a new visual experience, demonstrate some equipment, manufacturing processes, and explain some abstract principles, as well as how to realize unit operation in complex processes in the form of graphics and animation, so as to achieve better teaching effects.

### **3.3. Strengthening the combination of coal teachers' research directions and improving students' scientific research ability**

As a higher vocational college of energy and chemical engineering, the university has a very good research platform in the field of energy. In the teaching of coal chemical engineering, we should be good at combining the research topics of coal chemical teachers with the teaching of coal chemical engineering. Through various ways, students were shown their research results, so that students could better understand the teacher's research results and provide reference for students' future research.[2] On the basis of understanding the project, we will arrange some experiments on coal chemical industry to improve students' scientific research and practical ability. Coal chemical process experiment is an important link to understand, learn and master the experimental research methods of coal chemical industry. It can study a problem with obvious technical background of coal chemical industry. Students are required to consult the literature, collect the data, master the experimental methods, detection means and basic data as much as possible, and then conduct research from the selection of technical route, design scheme, equipment configuration, process and flow, and finally draw the most valuable conclusions. The setting of these experiments not only reflects the research content of coal chemistry technology, but also enables students to understand the knowledge of large-scale device technology, and improves the scientific level of students. It is a comprehensive training of students' comprehensive quality and provides scientific basis for students who are ready to continue their studies in the future.

### **3.4. Strengthening the connection with the industry and strengthening the achievement orientation**

Coal Chemical Technology is a practical engineering course, which is not isolated in the school syllabus. In teaching, teachers should encourage students to participate in the "college student science and technology innovation competition". Some topics are related to "coal chemical industry", and they can explain the knowledge of material circulation, conversion rate, product separation, purification and other aspects in combination with the topics, so as to strengthen the comprehensive quality of students. In teaching, the combination of theory and practice is emphasized, and the innovation consciousness of process design and technical transformation is emphasized. We should cultivate students' ability to consult and use chemical literature and professional manuals. Through the training of these skills, they can have a better application foundation in the future chemical technology work, and improve their ability to analyze and solve problems in engineering applications and creativity, so as to meet the needs of modern chemical industry for high-level application-oriented professional technicians.

Secondly, we should pay attention to the combination of theory and practice and the cultivation of engineering practice. This course mainly analyzes the typical coal chemical process to improve students' practical operation ability. On this basis, the teaching method of combining theory with practice is strengthened, and the cultivation of students' engineering practice ability is strengthened. We should carry out scientific management on the content of teaching materials and cultivate students' awareness of technological innovation. In the whole process of teaching, teachers always insist on teaching in different ways, replacing the "cramming" teaching method with "heuristic", "problem-based" and "discussion based" methods, so as to improve students' learning enthusiasm, cultivate students' ability to actively think, question, explore, discover and solve problems, and stimulate

students' innovative spirit. It can not only provide the society with high-quality coal chemical professional and technical personnel, but also provide better employment opportunities for the vast number of graduates.[3]

### **3.5. Strengthen the talent training standards, enhance the students' innovation ability and engineering quality**

In the teaching activities of coal chemical technology, teachers should strengthen the current talent training standards, so that the talent training can meet the social development needs of the current era, change their own teaching mode as far as possible, and promote the comprehensive ability training and development of students. In strengthening the talent training standards, it is necessary to focus on the two important aspects of students' innovation ability and engineering quality, which is an important transformation and development direction of coal chemical technology professional course teaching. From the perspective of students' comprehensive development, deepen the talent training standards, formulate a new talent training plan, so that students can really go to work after learning the knowledge, and can give full play to their real talents and work. How to improve the teaching quality in a relatively short period of class time, and cultivate high-quality coal chemical industry technical talents with innovation ability, high engineering quality and meet the requirements of employers, has become a hot issue of the current chemical industry higher educators.

In the teaching, the combination of theory and practice is emphasized, and the innovative consciousness of process design and technological transformation is emphasized. First, cultivate students' ability to consult, use and use chemical literature and professional manuals. Through the training of these skills, it can have a good application foundation in the future chemical technology work, and can improve its ability to analyze and solve problems and create engineering applications, so as to meet the needs of modern chemical industry for high-level applied professionals. Secondly, pay attention to the combination of theory and practice, pay attention to the cultivation of engineering practice. This course mainly analyzes the processing process of typical coal chemical products to improve students' practical application ability. On this basis, the teaching method of combining theory and practice is strengthened, and the cultivation of students' engineering practice ability is strengthened. Finally, the content of the teaching material should be managed scientifically to cultivate students' consciousness of technological innovation. In teaching, we always adhere to the "heuristic", "problem type" and "discussion type" way to replace the "cramming" teaching method, in order to improve students' enthusiasm for learning, cultivate students' positive thinking, questioning, inquiry, discovery and problem-solving ability, so as to stimulate students' desire for reform and creation. It can not only deliver high-quality coal and chemical professional and technical personnel for the society, but also provide better employment opportunities for the majority of graduates.

### **3.6. Reform the theoretical teaching method and pay attention to the application of diversified teaching methods**

Teaching method plays a very prominent role in classroom teaching, and a good teaching method can promote students' learning and promote the improvement of teaching quality. In the traditional coal chemical technology class, the teachers are according to the conventional teaching method, drawing the process flow chart on the blackboard, which not only consumes time and effort, but also will reduce the teaching quality, resulting in poor teaching effect. To reform the theoretical method of teaching needs to apply diversified teaching methods from the perspective of students' comprehensive development and comprehensive quality improvement, to stimulate students' learning motivation and enrich their cognitive experience. On this basis, combined with the students' learning

interest points, combined with the key and difficult points of knowledge. The adoption of diversified teaching methods reflects the application advantages and values of different teaching methods, so as to maximize the educational goal of improving students' comprehensive abilities. Faced with such a situation, the following teaching measures are taken:

First, the course content was modified and a multimedia teaching was conducted. The development speed of coal chemical industry is relatively fast. The main content of the course should be combined with the current situation and development, and presented in various forms of pictures, two-dimensional animation and other forms. Using a variety of forms of courseware, can not only make students do not produce aesthetic fatigue, but also can deepen the understanding of chemical devices. Using multimedia technology can greatly save the teaching time and improve the teaching effect. In the multimedia teaching activities, the interaction between teachers and students can be enhanced. Students have what learning difficult points, can also timely review the teacher used in class some courseware, multimedia materials. Multimedia teaching method is an important way under the background of information teaching reform and development, which has been recognized and concerned by more teachers.

Secondly, adopt the interactive teaching mode. Interaction refers to the communication and communication between students. In teaching, "interaction" is a special teaching method, which can make the connection between students and students even closer. The relationship between teachers and students is too distant, which will make the students' interest in learning more and more obvious, thus seriously affecting the normal progress of teaching and teaching. Use the contrast teaching method. This course is an extension of the petrochemical technology major, which is offered mainly because of the many similarities between the production process and equipment of refining and refining. By strengthening the knowledge learning comparison between the students' different courses, the students can master the effective learning rules between these similar chemical industry courses, and then form the students' own knowledge system and structure, and can achieve the effect of mastery when learning other difficult knowledge points.

#### 4. Conclusion

To sum up, in the process of teaching reform and development of Chemical engineering specialty in recent years, it is difficult to train high-quality technical talents. The school requires teachers to clarify the current development direction of education reform, explore teaching plans and teaching plans of coal chemical technology suitable for students' personal development, and publicize the latest development technologies and achievements of the industry to students, in order to guide students to actively participate in practical exploration. We should encourage students to do more experiments to improve their hands-on ability, and combine scientific research with students' personal development, so as to improve students' comprehensive quality, and strengthen students' comprehensive ability to analyze and solve problems.

#### References

- [1] Yu Y, Nie H, Dai Z, Tian L, Song L. *Ideological and political practice and exploration of inorganic chemical technology teaching process [J]. Industry and technology forum* 2021;20(09):196-197.
- [2] Zhang H, Chu M. *Teaching practice and discussion of Coal Chemical Technology based on OBE concept [J]. Guangdong chemical industry* 2020;47(23):152+188.
- [3] Kang Q, Liu R. *Teaching practice and discussion of chemical engineering technology under the concept of green chemistry [J]. Chemical engineering design communication* 2019;45(09):175-176.