

# Chemical Industry Principles Application Course Reform Implementation Plan

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**Abstract:** "Chemical Principles" is a professional foundation course for studying the common laws involved in the chemical industry and other industrial production processes, carrying the dual attributes of professionalism and application. This course takes an important position in the relevant professional curriculum system. It is an important bridge and link for students' learning from basic to professional, from theory to engineering. It plays an important role in the cultivation of students' comprehensive quality, engineering ability and innovation consciousness. By changing the traditional teacher-oriented teaching mode, this paper establishes a "student-centered, teacher-led" teaching model, enhances the teachers' own basic qualities, establishes engineering and project thinking, and stimulates students' interest in the course of chemical engineering. To develop students' team awareness, independent thinking and ability to solve problems and solve problems. Comprehensively improve the teaching quality of the secondary vocational chemical industry, and provide reference for the full implementation of the project teaching mode.

## 1. Introduction

The course of chemical engineering takes the unit operation as the main content. In the teaching and learning process, through the experiment of the simulation device and the physical factory internship, the relevant knowledge points can be fully grasped [1-2]. The abstract, segmented knowledge points are made concrete through specific, visible, and operational experiments [3-4]. The chemical industry is a constantly developing basic industry. It has different characteristics in different historical periods. Only by closely combining actual production can we grasp the trend of continuous development and learn relevant knowledge [5-7]. A great difficulty in teaching the principles of chemical engineering is that students should not be able to combine the knowledge of learning in the classroom with the actual production [8-9]. Although the internship was arranged during the course of the course, but the time was tight, the students could only go to the factory to visit and talk about the application of knowledge [10-13]. Therefore, it is a good way to improve students' practical ability by letting students design projects in real life or production, and letting students apply what they have learned through project design.

## 2. Analysis of the Teaching of Chemical Engineering Principles

### 2.1 The Meaning of the Course of Chemical Engineering.

The principle of chemical engineering is a technical and theoretical course on chemical engineering processes. It provides a scientific basis for the process industry (including chemical, light industry, medicine, food, environment, materials, metallurgy, etc.), and has played a role in the development of chemical engineering and related disciplines. Quite important role. The course of chemical engineering takes unit operation as the main content, with the principle of transfer process and research methodology as the main line, studying the basic laws of various physical and chemical processing processes, the design method of typical equipment, the operation of the process and the principle of regulation. The course of chemical engineering is an inevitable outcome of the chemical industry and engineering development. At the end of the 19th century, foreign universities

successively opened chemical engineering courses. The main courses were production process courses based on the characteristics of their respective industries, and the main theoretical basis lacked sharing recognition. Knowing that knowledge is chaotic, through a period of development and continuous summarization, in the early 20th century, everyone realized the physical and chemical commonality in the industrial production process, and published the first textbook on chemical engineering principles. China introduced chemical engineering in the 1920s and opened a course in chemical engineering.

## **2.2 Characteristics of the Course of Chemical Engineering.**

The principle of chemical engineering is an interdisciplinary subject. The Principles of Chemical Engineering is a foundation course on the theory of process industry, which covers disciplines including chemistry, physics, mathematics, engineering, economics, and computer science. Comprehensive use of knowledge of various disciplines to form a complete set of theories and solutions in the process of chemical engineering and industrial production. Any single-disciplinary knowledge theory cannot explain and solve the knowledge points and problems encountered in chemical engineering and industry. Only by comprehensively applying various knowledge, through continuous integration, adjustment and practice, the basic theory is finally formed. As the chemical industry continues to develop, more and more disciplines will be applied, and control and simulation will become more and more precise. The principle of chemical industry comes from actual production and serves the production process. The principle of chemical engineering is about the theory of chemical engineering and industry. The formation process is an applied scientific theory through continuous experimentation, experimentation and practice, summing up experience and gradually forming the theory in the process of continuous development of the chemical industry. At the same time, the chemical principle directly serves the chemical industry production process, guiding the formulation of the process route, equipment selection and installation, and the final system operation. The two are closely linked and complement each other and are inseparable.

## **2.3 The Practical Process of Teaching Chemical Engineering Principles.**

The teaching practice of chemical engineering principles is mainly divided into two ideas. A teaching method is a curriculum model that focuses on learning tasks, organizes course content, and completes learning tasks as the main learning mode by students, allowing students to experience tasks, produce independent work, show results and summarize this. A complete "learning process." All teaching content must be modularly integrated as in the Fluid Mechanics and Fluid Transfer Equipment section, divided into six modules. Each module provides students with teaching objectives, learning difficulties, guiding questions, learning tasks and class discussion content, and sends them to students before class. The students are assigned specific learning tasks according to the interval between the two classes. At the same time, students are grouped according to the characteristics of students, learning status and personal will, and each group of students is required to focus on teaching objectives, learning difficulties, guiding problems, and learning tasks, and require independent learning before or during class, and complete corresponding learning. task. In the class, the teacher teaches the background of knowledge, examines the completion of the student's learning tasks, and accepts the joint questioning of the teacher and the student. The teacher is supplemented with guidance and assistance. In the class, teachers will further guide students to deepen their understanding of some key and difficult learning contents, and combine with life examples, engineering cases and learning tasks to implement "case-based " and "problem-discussed " teaching. By designing "problems " and introducing "cases ", students are encouraged to think, summarize and report. After class, the corresponding assignments will be arranged for supplementary exercises to complete a teaching module.

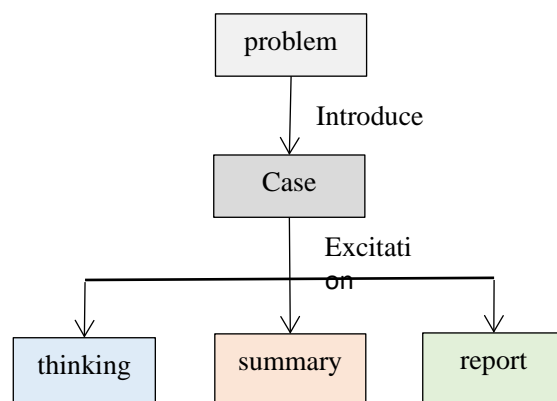


Figure 1. Teaching process of chemical engineering principles

### 3. The Status Quo of Applied Courses of Chemical Engineering Principles

#### 3.1 The Teaching Mode of Chemical Engineering Course is Single.

At present, most of the students in the school choose a vocational college because they do not have a good university. These students did not lay a good foundation in the junior high school stage, and their learning ability was poor. After entering the secondary vocational school, they faced a new basic course of chemical engineering and practical training courses. Lack of learning initiative, most students did not develop good study habits, learning initiative, poor enthusiasm, lack of interest in learning. In particular, when encountering a relatively professional chemical engineering course, it is difficult to adapt, lack of learning perseverance, and retreat in the face of difficulties. In the traditional teaching, the teacher's lecture is the main, the classroom teaching is the main, and the objective reality of the secondary vocational students is not taken. The theoretical content and the application of the equation are overemphasized, the basic knowledge of the students cannot keep up, and the learning process is difficult, so that they are tired of learning. The mood is higher.

#### 3.2 Application Practice Teaching is not Practical.

In the experimental teaching session, many students only copied the contents of the experimental materials of chemical engineering principles to the experimental report form. As an experimental preparation, there was no active learning behavior. During the experiment, the teacher explained the principle and operation flow and demonstrated it again. Students imitate the operation again, the students will only imitate, can not develop the students' self-consciousness and creative thinking ability; students have little knowledge of the chemical knowledge around them, the engineering ideas are weak, and there is no interest in the experiment. Moreover, the curriculum design topics are relatively old. The students' attention is not enough, the students' initiative and innovation consciousness are not well played, and the design results are almost the same. There is only one student in the same group who completes the design from beginning to end, while other students completely copy it. At the same time, the design content is quite different from the actual situation of the project, and it is difficult to cultivate students' innovative thinking and engineering awareness.

#### 3.3 Heavy Theory, Light Practical.

The principle of chemical engineering is an extremely important professional foundation course for school chemical and similar majors. The purpose of the teaching is to enable students to understand and master the basic principles of operation of each unit in the process of chemical industry, basic equipment forms and operations, to help students establish correct engineering concepts, lay a solid foundation for engineering and engineering methods. The course involves a wide range of knowledge, engineering practice, and a variety of equipment. In addition to theoretical teaching, practice and experiment are also very important, so only the combination of the two can achieve better teaching results. However, in traditional teaching, the emphasis on

theoretical teaching, neglect and production practice, the students' hands-on ability and skill level can not meet the current social requirements for chemical talents.

#### 4. Implementation of the Application of the Chemical Engineering Principle

##### 4.1 Adjust the Assessment Form.

The diversity of curriculum assessment methods and flexibility require the support of the school. It is recommended that all courses be no longer limited to 20% of the usual grades, 10% of the experimental scores, and 70% of the final grades, and the proportion of the usual scores of 20%, the experimental scores of 40%, and the final grades of 40%, as shown in Figure 2. Shown. The final result focuses on the final final written test scores. It is not very reasonable for the engineering practice-oriented courses, because the written test is generally more about concepts and calculations, and there are few design-oriented questions for cultivating design thinking skills. Design-type topics often involve many charts, data, and even semi-empirical and semi-theoretical engineering formulas for finding engineering manuals, which are not reflected in a test paper. On the one hand, in order to facilitate the volume of the volume and the ease of control of the students' answers, the teachers often give the data of the search data directly. On the other hand, it is also because the school is too fine in the examination paper examination system, and the teacher loses the freedom to give points. There is a lack of steps for students to check the information. It is recommended to allow teachers to freely control the reasonable placement of scores. The final exam of the reform exam will determine the total score of the test paper, as well as the proportion of self-study and hands-on ability scores. The course of chemical engineering is an engineering subject that students have initially contacted. In the process of learning the course, attention should be paid to cultivating engineering awareness and exercising practical skills. Therefore, the proportion of experimental results should be increased on the basis of the original.

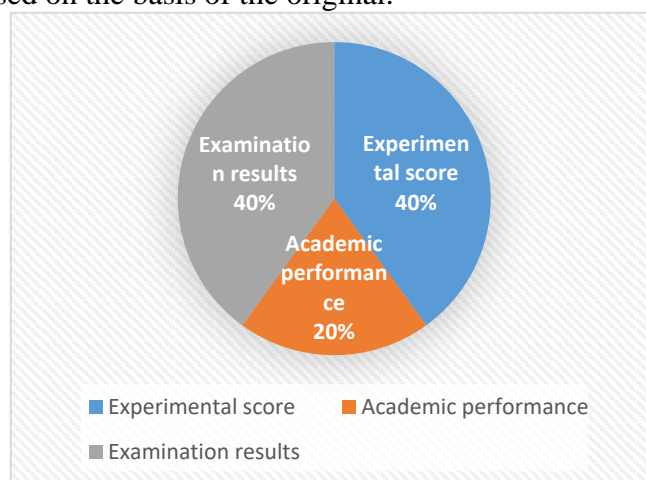


Figure 2. Score Ratio Map of Scientific Assessment

##### 4.2 Appropriate Introduction of New Teaching Methods.

At present, the university teaching mainly adopts the opposite teaching mode of the subject and object of "teacher classroom teaching", and the teaching method is relatively simple. In order to improve the quality and efficiency of teaching and achieve the goal of diversified teaching, this course should introduce new teaching methods appropriately. For example, in the teaching process, the teaching method of comparative summarization can be used to compare and summarize the commonality and individuality of each unit operation of chemical engineering principles, and not only can link old and new knowledge, but also help students master the learning methods and ideas and improve. The efficiency of learning. For another example, in the teaching process, classroom discussions are appropriately introduced, with students as the main body, discussion, learning and communication in a group format for a particular topic or case, and preparation of relevant materials to be displayed on the stage, and finally to review and summarize. In addition, it is also possible to

add a variety of teaching modes such as case lessons and exercise classes, make full use of carriers such as cases and exercises, and fully discuss the content of the course, practical engineering, and problem solving to increase the vividness of the classroom and optimize the learning effect.

### 4.3 Combination of Traditional and Modern Teaching Methods.

In the traditional chemical engineering principle classroom, teachers read lecture notes, copy blackboard books and instruct students to do exercises. The classroom atmosphere is rather dull, while students passively accept knowledge, and the learning efficiency is low. In addition, the principle of chemical engineering has many contents, too much blackboard writing is not conducive to teachers to complete the prescribed teaching tasks in limited classroom time. Although it can be compensated by making up lessons, making up lessons increases the burden of teachers and students, and is not conducive to improving the teaching effect. Therefore, introducing information-based teaching resources and modern teaching methods into the classroom is the only way to reform the teaching of chemical engineering principles. Using multimedia in classroom teaching can not only simplify Abstract concepts, improve course capacity and quality, make up for the inconvenience caused by reducing class hours, but also vividly display the structure and working conditions of various types of equipment, so that students can understand the structure and operation of equipment in an all-round way without entering the production site. Do. In addition, we can make full use of the simulation tool of chemical engineering principle to assist teaching, make the teaching process more vivid and image, and improve the teaching effect in an all-round way. It is necessary to combine modern multimedia teaching with traditional blackboard teaching to improve the teaching effect. Because proper blackboard writing helps to improve students'attention and slow down the rhythm of the classroom, relaxation in the classroom is conducive to students' digestion of knowledge points.

## 5. Conclusion

From the perspective of students themselves, project-based teaching can cultivate students'rich practical knowledge, realize the transition of knowledge from books to enterprise applications, and provide more space for students' healthy development; from the perspective of school development, it can achieve long-term development in a real sense, cultivate talents who really meet the needs of market and enterprise development; from the perspective of enterprises, it can recruit talents. It is the common need of students, schools and enterprises to better meet the needs of high-quality and practical talents with rich practical experience.

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