

# A New Daily Teaching Mode of Analytical Chemistry Course based on the Higher Vocational College Skill Competition

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## Abstract:

*By introducing the standard of vocational college skill competition into the daily teaching of analytical chemistry course in higher vocational college, a more reasonable teaching mode is constructed to improve the enthusiasm of the students on analytical chemistry, and to improve the operational standardization of analytical experiments and accuracy of analytical results, hoping to transport more excellent players for skills competition, and reserve a large number of industrial analysis and testing technical skill talents for the social.*

## Keywords:

*Analytical chemistry; Skill competition; Teaching mode*

## Introduction:

Since the Ministry of education began to organize the vocational college skills competition in 2006, the vocational college skills competition of various events has been carried out in full swing. Among them, the industrial analysis and inspection skills competition is one of the most extensive competitions in the field of industry including chemical industry, petroleum, medicine, health, inspection and quarantine, biology, agriculture and forestry and other industries [1].

The competition of industrial analysis and inspection is set up to improve the practical operation ability of students, based on demand of the teaching reform and development of majors relative to industrial analysis and inspection in higher vocational education. The competition questions usually include three parts: the first part is the theoretical and simulation assessment items (the score accounts for about 30%), in which the theoretical questions assess the theoretical part of analytical chemistry, and the simulation questions assess the combination of gas chromatography and mass spectrometry; the second part is the chemical analysis operation item (the score accounts for about 35%), that commonly means the assessment of titration analysis operation; the third part is the instrumental analysis operation item (the score accounts for about 30%), in which Ultraviolet visible spectrometer is generally tested. The contents of the above three parts mostly come from the analytical chemistry course that is a general course of the college students who major in chemical engineering or related majors. In order to achieve good results in the skill competition, the daily teaching mode of analytical chemistry can be changed and improved.

## 1. The enlightenment of skill competition on Analytical Chemistry Teaching

### 1.1. Proportion of practice is more important than theoretical learning

For the students of higher vocational colleges, it is not wise to compare the theoretical knowledge with the students of universities, because they are not so good at book learning compared with the latter. They should focus more on the experimental operation skills, pay more attention to the standardization of operation and the accuracy of analyzing results, and work really hard on the operation details. This opinion can also be verified by the items assessment of the industrial analysis and inspection competition. The proportion of practical operation scores which takes about 70% is much higher than the theoretical knowledge score which takes about 30%. Therefore, in the daily teaching, we should highlight the cultivation of students' experimental operation skills.

### 1.2. Team spirit cultivation is necessary

The professional skills competition is entered in the form of teams, and each team is composed of two contestants. Each contestant must take part in the theoretical and simulation examination, chemical analysis operation examination and instrumental analysis operation examination. The final score of the team is the sum of the two contestants' scores. In other words, the players need to reach a good tacit understanding in the usual training, be able to effectively communicate and share information, and form a win-win relationship in order to achieve good competition results. Therefore, during the daily teaching of analytical chemistry course, we need to consciously cultivate the students' ability and habit of teamwork.

### 1.3. More attention should be paid to the standardization of experimental operation

The standardization of chemical experiment operation is the prerequisite to ensure the accuracy and reliability of the experimental data. In the scoring standard of the industrial analysis and inspection skill competition, the operation process score accounts for about 30% ~ 40% of the total score of the experiment. The scoring rules of the competition make strict and detailed requirements for the standardization of each experimental operation step, for example, whether the glass instruments is correctly leak tested before the operation begin, whether the volumetric flask is shaken when the solution is diluted to the two-thirds of the volume with water, whether the liquid level is accurately tangent to the mark line, and whether the color of titration ending point is controlled properly, etc. [2]. In addition, the standardization of the experimental operation will also affect the precision of the parallel experiments, which accounts for 20% ~ 35% of the total experimental score [3].

## 2. The exploration and practice of the daily teaching mode of Analytical Chemistry Course

### 2.1. Reset the contents of analytical chemistry and construct a teaching system containing theory and practice

Based on the professional skills competition, we revised the content of analytical chemistry course based on the actual production of local chemical enterprises. Taking the analysis and inspection tasks of enterprises in actual production as the main line, we integrated the chemical analysis knowledge and the instrument analysis knowledge into different analysis and inspection production tasks. The theoretical teaching contents are arranged according to real enterprise production tasks [4]. In each task, relative theoretical analysis knowledge and key points of experimental operation are introduced helping students to comprehend the mission. In this way, the theoretical knowledge combined with the production tasks would become much easier to learn. So we realized the integration of "teaching, learning and doing". The six learning units of teaching material are composed of theoretical knowledge, in-school training, out-of-school practice teaching (following post practice and post-curricular practice) and after-school learning. The theoretical knowledge involved in these six learning units is closely related to the necessary operation skills, and the theory and practice are closely linked to form a complete teaching system with the purpose of taking the practical skills training as the principal thing [5].

### 2.2. Reform of the evaluation system to improve overall teaching effectiveness

The traditional examination mode of a test paper is eliminated, and the final score is evaluated by theory and operation. The theoretical examination is divided into two parts: teacher score and student mutual score. The promotion of this model avoids the disadvantages of narrow coverage of final examination papers and the inability to assess experimental operation skills, while the part of the student score makes up for the teachers in the examination of skill operation. Due to the large number of classes and chemical laboratory occlusion caused by incomplete observation and other problems. The quantitative table of students' final general evaluation is shown in Table 1.

Table 1 Quantification of The Final Term General Evaluation

Project	Form of assessment	Project Full score	Assessment content	Project Percentage share Score	Student's Final Total
Theoretical assessment	Final Closed-book Exam	100	Theoretical knowledge of analytical chemistry course Acid-base titration,	40%	

Experimental exercises Assessment	Check at ordinary times, teachers score 60%, students score 40%	600	coordination titration, redox titration, precipitation titration, gravimetric analysis, UV-Vis spectrophotometry	50%	
Civilized operations	Check at ordinary times	100	During the course of the experiment, the table surface is neat, the instrument is orderly, and there is no major negligence such as breaking the instrument	100%	

### 3. Conclusion

Vocational college skill contest is the booster of vocational education reform and development. It is the need of social development and the necessity of social development<sup>[6]</sup>. In the daily teaching of analytical chemistry courses, we can introduce the model and scoring standard of the skill contest, start with the course content setting, the improvement of teaching methods and means, the innovation of evaluation mechanism, build a more efficient and reasonable daily teaching mode of analytical chemistry course based on the skill contest, improve the enthusiasm of higher vocational students to study analytical chemistry course, improve the accuracy of analytical experiment, enhance the team cooperation consciousness and ability, in order to transport more high-quality contestants for vocational skill contest, and reserve a large number of high-skilled talents of industrial analysis and test technology for the society.

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