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USING THE CASE METHOD IN TEACHING CHEMISTRY

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Annotation
It is known that the main goal of the modern pedagogy in its development is to train specialists, those who have information and communication technologies that allow the application of fundamental knowledge, fundamentals of project activities in solving specific professional problems, suggestions as a method of progressive pedagogical technology. The article describes the activity training during the practical training of the "Organic Chemistry" course for students in the directions of the pedagogical experience described in the article. The use of the case method activates students' cognitive activity, develops motivation for learning, and ensures the correctness of the saying that practice without theory, and theory without practice, is meaningless.

Keywords: work method, higher engineering education system, state method, state, state technologies, application methodology, case method, organic chemistry, synthesis gas, ethanol, insecticide, pesticide, anesthetic, rules, orientation in the benzene ring.

Introduction

It requires the search for teaching methods and forms of organization of the educational process that allow the introduction of a competency-based approach in educational practice. It is appropriate for the student to get the necessary information not in a ready form, but in the process of research and creative understanding. The search for solutions to this problem has led to an expansion of understanding of the possibilities of case technology in higher education.

The CASE method (Computer-Assisted Structure Elucidation) is an innovative approach to teaching organic chemistry, which allows automatic determination of the structure of unknown molecules using computer technology [1, 3]. This method is currently of great importance because it can significantly speed up the process of identifying new compounds.

In the modern world, the pharmaceutical and biotechnology industry is developing rapidly, and new materials and polymers are emerging. All these fields require precise determination of the structure of molecules, which makes the CASE method particularly relevant.

In addition, the use of the CASE method in the teaching of organic chemistry allows to improve the quality of training of specialists in this field. Learning with CASE allows students

to gain a deeper understanding of molecular structures and patterns, accelerate the learning process, and improve educational efficiency.

Thus, the CASE method is of great importance nowadays and can be useful for many fields related to organic chemistry and for improving the quality of teaching students in chemistry.

CASE (Cognitive Acceleration through Science Education) is a teaching method developed in the UK in the 1980s. It is based on the idea that the use of special tasks increases the level of intellectual development of students and helps them to better understand complex scientific concepts. The CASE method is successfully used in teaching many scientific subjects, including organic chemistry [2].

Organic chemistry studies chemical compounds that contain carbon. This is a very important area of chemistry because most biologically active molecules such as proteins, carbohydrates, and lipids are composed of carbon. Organic chemistry is also widely used in medicine, pharmacology, food and petrochemical industries.

The CASE method involves the use of special tasks that help students improve their thinking ability [1, 6]. In the case of organic chemistry, these tasks can be aimed at developing the following skills in students:

1. Abstract thinking: students should be able to analyze complex chemical concepts and relate them to real life examples.
2. Critical thinking: Students should be able to evaluate the given information and draw conclusions based on their analysis.
3. Logical Thinking: Students should be able to apply logical principles to a variety of chemical concepts and solve complex problems.

An example of tasks that can be used in the teaching of organic chemistry in the CASE method is to determine the structure of organic compounds. In this assignment, students are given a set of data such as mass spectrum, infrared spectrum, and nuclear magnetic resonance (NMR), and based on this data, they need to determine the structure of the compound. This task requires students to apply their knowledge of chemistry and mathematics to determine the structure of a compound and to use the information obtained logically [4].

Using the CASE method in teaching organic chemistry can improve understanding of complex concepts and help develop thinking skills that can be useful not only in chemistry, but also in other scientific disciplines. This method can be especially useful for students who have difficulty understanding chemistry concepts or who have limited experience in the subject.

Instead of traditional chemistry labs, you can use practical situations, and then instead of simply pouring substances into test tubes, students are well-prepared to strengthen their knowledge, skills, and decision-making in this situation. Practical cases should be as specific and detailed as possible, and this can best be reflected in practical work. I think that it is possible to use practical cases in the study of the topic "Chemical industry". For example, when studying ethanol production in the 11th grade.

Role playing Method

A letter to the project institute: "The owner of our factory gave instructions to organize ethanol production, we have never produced it and we do not know how to do it. Help to obtain ethanol in an industrial way!".

Job 1. The task for logisticians: what raw materials are needed for the production of ethanol, how to use the final product. (Internet resources can be used).

Case 2. Task for Economists: Analyzing the Costs of Ethanol Production.

Information material

1) Industrially, ethyl alcohol is obtained by anaerobic fermentation of vegetable carbohydrates with the participation of yeast and ethylene hydration. There are ways to obtain ethyl alcohol: direct synthesis from CO and H2 or through methyl alcohol. ($CO + 2H_2$): $CO + 2H_2 \rightarrow CH_3OH$. 50 kg of alcohol is obtained from 20 m^3 of hydrogen.

2) Alkaline hydrolysis of halogen derivatives of alkanes:

$C_2H_5Cl + NaOH \rightarrow C_2H_5OH + NaCl$. 40 kg of ethanol is obtained from 100 kg of chloroethane

3) Oxidation of methane in the presence of catalysts: $C_2H_6+O_2 \rightarrow C_2H_5OH$. 200 kg of ethanol can be obtained from 100 kg of methane

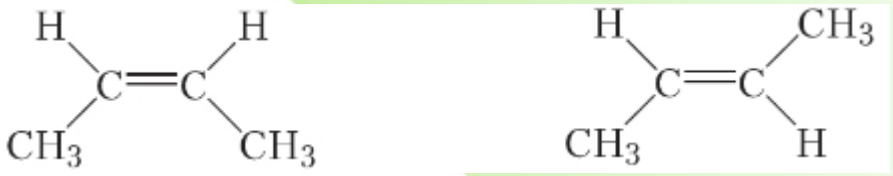
Note: The efficiency of the reaction is estimated by the mass fraction of the product yield.

Substance name	Unit of measure	Price, in soums (2022)
Methane	1 l	1500
Oxygen	10 m^3	30000
Synthesis gas	1 l	1200
Ethyl chloride	1 l (ρ=0,903 g/l)	13000
Sodium hydroxide	1 kg	65000

Another example of case study

1. Physical properties of alkanes and alkenes.

When the author studies the physical properties of alkanes in organic chemistry, he focuses on explaining that the boiling point of alkanes depends mainly on intermolecular forces, which include van der Waals forces and hydrogen bonding, and van der Waals forces are related to molecular bonds. liq. mass and molecular polarization. The melting point of a substance is related not only to molecular interactions, but also to molecular symmetry: the better the symmetry and the closer the molecules are in the crystal lattice, the higher the melting point. When discussing the physical properties of olefins in chapter 3, the author does not explain the factors affecting the boiling point and melting point of substances, but the following cases are presented directly: Butene-2 exists in two isomers , in their molecules, the bonding sequence of the atoms and the position of the double bond are exactly the same, but the spatial arrangement of the atoms is different.



Since cis-butene-2 and trans-butene-2 are different substances (isomers), they have different properties. The melting point of cis-butene-2 is -138.9 °C, and that of trans-butene-2 is above 33 °C (-105.5 °C).

Question: Why does the cis structure have a high boiling point and a low melting point?

Give the whole class 3 minutes to reflect and discuss, then ask students to respond. According to the basic knowledge they are learning (about 5 minutes) and finally the teacher summarizes the thoughts of all students: cis-2-butene and trans-2-butene are isomerides, the boiling points of the substances depend on the molecular polarities. : cis -2-butene is more polar than trans-2-butene, so the boiling point of cis-2-butene is higher than that of trans-2-butene; Although the melting point is related not only to molecular interatomic forces, but also to molecular symmetry, the symmetry of trans-2-butene is high, so its melting point is also high.

In this way, students will better understand the factors affecting the boiling point. and melting points will also learn how to solve real-world problems using the underlying knowledge they have learned.

Using the case method in teaching chemistry can be very useful for students because it helps them to better understand how to apply knowledge in real life. Cases can be problem situations or tasks that require a solution based on the knowledge and skills acquired in the study of chemistry.

An example of this can be a review of technologies for the production and use of different types of fuels. As part of such work, students can get acquainted with the processes of obtaining gas from biodiesel, methanol, coal and other fuels and problems related to their use. The case method also helps develop critical thinking and problem solving. Students must research information, identify factors that influence problem solving, and form their own opinions based on the information.

Thus, the use of the case method in teaching chemistry helps to significantly increase the knowledge of students, to better understand the connection between chemical processes and real problems, and also to develop critical thinking and problem-solving skills.

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