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NEW PEDAGOGICAL APPROACHES AND INTERACTIVE FORMS OF TEACHING CHEMICAL COURSES

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Аңдатпа. Химиядан сандық есепті шығару студенттер мен магистранттардың практикалық дағдыларын дамытуға ықпал етеді. Осы мақсатта «Химияны бізбен оқы» / «Учи химию с нами» атты YouTube арнасы құрылды, ол студенттер мен магистранттардың білімін, қабілеттері мен дағдыларын тексеруге арналған алаң. Химиялық пәндерді оқыту кезінде табылған тағы бір педагогикалық жаңалық - бұл химиялық жол картасы - есеп шешудің арнайы алгоритмі.

Түйін сөздер: күрделілігі жоғары есептер, көрнекі оқу материалы, есепті шешу толық алгоритмі.

Аннотация. Решение химических расчетных задач способствует приобретению практических умений и навыков студентов и магистрантов. С этой целью создан YouTube канал «Химияны бізбен оқы» / «Учи химию с нами», являющийся площадкой для тестирования знаний, умений и навыков студентов и магистрантов. Еще одной педагогической находкой в ходе преподавания химических дисциплин является химический путеводитель - разработанный алгоритм решения задачи.

Ключевые слова: задачи повышенной сложности, визуализированный учебный материал, подробный алгоритм решения задачи.

Annotation. Solving chemical calculation problems contributes to the acquisition of practical skills of students and graduates. For this reason, the YouTube channel “Химияны бізбен оқы” / “Учи химию с нами” was created, which is a platform for testing the knowledge and skills of students and graduates. Another pedagogical finding during the teaching of the chemical courses is a chemical guidebook - a developed algorithm for solving problems.

Key words: advanced problems, visualized teaching material, a detailed algorithm for problem solving.

Updating the content of education in the Republic of Kazakhstan requires improving the pedagogical skills of teachers. The development of Kazakhstani students goes through the introduction of active forms of learning. Students independently develop functional literacy, actively acquire knowledge, passionately develop communication skills and creatively approach problems. The teacher’s goal is to educate students as independent learners, bring out the joy of self-awareness, interest them in further deepening their knowledge and make them the subject of the learning process [1]. Therefore, it is important that future teachers meet the expectations of society, being able to contribute to the development of the student in the required direction.

Courses like "Solving Advanced Problems", "Solving of Chemistry Olympiad Problems" for specialities 6B01504-Chemistry and 7M01504-Chemistry, and number of other courses, develop the ability of undergraduates and graduates to plan, organize and practically implement the most effective ways and methods of solving advanced problems in Chemistry. Problem solving improves practical skills of undergraduates and graduates that are of great importance for deepening and concretizing a number of theoretical principles of Chemistry, and are crucial elements of the educational process in Chemistry.

The educational materials of these courses are didactic materials for the future professionals, used in teaching practices and work at school. The provided problems for students and graduates are compiled in accordance with the level of difficulty of school Olympiads. With an accurate analysis, the increasing level of those tasks' difficulty should be noticed. The study of these courses develops the necessary skills for students to solve complex problems, used in preparation for Chemistry Olympiads.

Students and graduates are given problems with the goal of self-assessment of the ability to solve multifaceted problems in various ways. For this reason, the YouTube channel "Химияны бізбен оқы" / "Учи химию с нами" was created, which is a platform for testing the knowledge and skills of students with the materials that are self- and mutually evaluated [2]. The generation, which has grown up with constant exposure to technology, can navigate easier in the virtual environment than their teachers. This means that the visualized material is assimilated and processed much faster and more efficiently than the verbal material, because it is presented in visuals, which are perceived simultaneously and holistically [3].

Another finding, discovered during the teaching of the courses "Solving Advanced Problems" and "Solving of Chemistry Olympiad Problems", is a chemical guide, which is a developed algorithm for solving a specific problem. The creation of the detailed algorithm (the chemical guide) is justified by the following:

- Solving the Olympiad problems accounts for a certain difficulty for an unprepared student;

- By creating an algorithm, student breaks down an advanced problem into a number of simple problems;

- The creation of the guide requires the students to have sophisticated understand of the course of solving the problem with application of knowledge at a new level.

The realization of the professional potential of the students, who will have to develop a strategy for finding ways and methods of solving problems, becomes obvious. He consciously uses pedagogical techniques and methods, active socio-psychological methods. When organizing and

planning work on a chemical guidebook, the students use such methods of developing creative thinking as searching, an alternative, canceling assumptions, analogies [4].

As a practical example of the chemical guidebook creation's results, we propose algorithms developed by different students, while working with the text of one problem.

The aluminum plate was dropped into a solution of tin (II) chloride weighing 131.79 g. After some time, the mass of the plate changed to 9.09 g. Determine the mass fraction of aluminum chloride in the solution after the reaction.

1-version.

$m_{solution}(SnCl_2)$= 131.79g Δm = 9.09 g	**Solution** Write the reaction equation
ω($AlCl_3$) = ?	x $SnCl_2$ + Al = 1 mol Denote the amount of aluminum substance by X

n_{Al} = X mol m(Al) = n•M =

Then, n_{Sn} = X mol m(Sn)= n•M=

Aluminum dissolves from the surface of the plate, and the tin comes instead.

Change in mass of the plate. We solve the equation

$\Delta m = m_{Sn} - m_{Al}$= ? x

? x = 9.09

x = ? mol ($AlCl_3$)

M($AlCl_3$) = **?** g / mol

m($AlCl_3$) = M·ν = (dissolved substance)

$m_{solution} = m_{solution}(SnCl_2) \pm \Delta m$ =

$\omega = \frac{msalt}{msolution} \cdot 100\%$ =

Answer: ω($AlCl_3$) = 6,52%

2-version.

m ($SnCl_2$) = 131.79g Δm = 9.09 g	**Solution** $SnCl_2$ + Al = M ($AlCl_3$) =
ω($AlCl_3$) = ?	

According to reaction V(Al)=

____ mol of aluminium - ____ m(Sn) – m(Al) change of plate's mass

According to given data

X mol of aluminium - 9.09 g m(Sn) – m(Al)

m ($AlCl_3$) = M· V

$m_{solution}$ = m ($SnCl_2$) – Δm =

ω($AlCl_3$) = m($AlCl_3$)/ $m_{solution}$·100% =

Answer: ω($AlCl_3$) = 6,52%

3-version.

	Solution
$M_{solution}$ ($SnCl_2$)= 131.79g	Write the reaction equation
Δm = 9.09 g	$SnCl_2$ + 2Al =
	54 g
w ($AlCl_3$)=?	Through the change in the plate's mass, we find mass of $AlCl_3$

According to equation m($AlCl_3$) _____ m(Sn)-m(Al)g

According to given date x g _____ 9,09 g

X = g ($AlCl_3$)

$M_{solution}$= $m_{solution}$ ($SnCl_2$)± Δm

$M_{solution}$=

We find the mass fraction of $AlCl_3$, substituting the found masses of $AlCl_3$ and solution into the formula

$$\omega = \frac{m(AlCl3)}{m(solution)} \cdot 100\%$$

$$\omega = \frac{\cdots\cdots}{\cdots\cdots} \cdot 100\% = \quad \%$$

Answer: ω($AlCl_3$) = 6.52%

It can be seen that in the chemical guide not only the used denomination differ, but also the approach to solving the problems [5-7]. In the first version, a mathematical equation is drawn up to find the amount of aluminum substance and aluminum chloride, respectively, from which the mass of salt is then determined. In the second version, the amount of aluminum substance is found from proportion. In the third version, the mass of salt was directly determined from the proportion.

Thus, solving computational problems using the chemical guide (the detailed solution algorithm) allows most effectively achieve the educational goals of the courses "Solving Advanced

Problems" and "Solving of Chemistry Olympiad Problems", speeding up the process of mastering the methodology for solving complex problems, increasing the reviewed number of problems discussed in the lessons, as well as introduce a new form of tasks in subjects - creating chemical guides by students and graduates themselves, the implementation of which is possible only at a sufficiently high level of mastering the discipline.

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