

## ПРОБЛЕМА ОРГАНИЗАЦИИ САМОСТОЯТЕЛЬНОЙ РАБОТЫ СТУДЕНТОВ В ОБУЧЕНИИ ХИМИИ

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## THE PROBLEM OF ORGANISING INDEPENDENT WORK OF STUDENTS IN TEACHING CHEMISTRY

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**Аннотация.** В статье раскрыта проблема организации самостоятельной работы студентов, структура самостоятельной работы студентов, а также функции самостоятельной работы при преподавании химии в высшем учебном заведении. Авторы в статье на примере дисциплины «Физическая химия» рассматривают агрегатные состояния вещества и приходят к выводу, что выполнение задач и упражнений в качестве самостоятельной работы по теме «Использование закона Гесса» позволяет применить теоретические знания на практике. В статье описано, как формируются умения и навыки студента в ходе лабораторной работы.

**Abstract.** The article reveals the problem of organising independent work of students, the structure of independent work of students, as well as the functions of independent work in teaching chemistry in higher education. The authors in the article on the example of the subject of physical chemistry students consider the aggregate states of matter; comes to the conclusion that the performance of tasks and exercises as an independent work on the topic «The use of Hess's law» allows you to apply theoretical knowledge in practice. The article describes how the student's skills are formed during the laboratory work.

**Ключевые слова:** самостоятельная работа; задача; задачи и упражнения; теоретические и практические знания; физическая химия.

**Keywords:** independent work; task; tasks and exercises; theoretical and practical knowledge; physical chemistry.

According to modern requirements, the task of a higher educational institution is to train specialists who are able to work independently in society, think freely, set goals, creatively determine and use methods to achieve them. Self-education, self-education and the process of self-improvement form the basis of education aimed at personal development. In order to establish a link between theory and practice of the subject, independent work under the guidance of a teacher is necessary [1, p.109].

Various academic tasks given to students in order to organise the cognitive process for independent work: mastering the theory; reading, researching or solving practical problems; writing an essay based on different sources of knowledge; translation of the text and others. Also, independent work is a manifestation of the actual activity of the student when performing a learning task (analysis of theory; comparison of concepts, phenomena, objects, obtained results; observation and generalisation; correction of the action plan, etc.). So, learning is independent work - the result of the student's actions in the course of acquiring new knowledge.

And the student's own work is the types of academic work related to the mastering of the necessary volume and content of educational material provided by the curriculum, the development of his intellectual, free and professional qualities.

All students' academic work is predominantly independent work, the level of its originality is determined by the degree and type of implementation of pedagogical (managerial) leadership in connection with its implementation.

The type of tasks in the independent work of students, the degree of their complexity are different for different courses of study and for different subjects.

The degree of complexity of tasks depends on the need to organise independent work in such a way that students constantly develop their professional creativity and self-awareness.

Independent work of students is the fulfilment by students under the guidance of a teacher of various educational, industrial, research tasks and thus obtaining general scientific, professional and personal knowledge, mastery, acquisition of skills, accumulation of creative experience [2, p. 32].

The instructor can provide the necessary assistance to the student at any time and at any stage of student learning management.

Such interaction is reflected in different types of lessons. Of course, for the types of lesson organisation (lecture, seminar, practical and laboratory work) the types of independent work should be planned in advance [2, p. 37].

In the course of traditional teaching, the structure of students' independent work is characteristic of both chemistry and other subjects [3, p.141].

According to the structure image image of the structure of student's independent work, student's independent work is divided into classroom and extracurricular work. Independent work in class (in lectures, practical classes, seminars, laboratory classes, consultations, colloquiums, test classes and exams) and independent work outside of class (homework, familiarisation with materials on the programme, scientific work, academic and practical work experience). coursework) and diploma work). course) and thesis).

Analytical work of students on any theoretical topic should be carried out in the following order [3, p.148]:

- Deepening and analysing the theoretical material with which students are familiarised in the lecture. Students perform the main directions of analysing the information with the help of the teacher.

- Discussion of theoretical material from the point of view of problem solving at the seminar class. Under the guidance of the instructor, students identify specific problems on the theoretical material and consider ways to solve them.

- Students assimilate the theoretical material presented by the teacher from a creative point of view and present the results in their written work. Students discuss their joint work outside of class, consider ways to deepen their work, give advice to each other, and evaluate each other's work.

- Students' creative work is evaluated from the teacher's perspective.

Belonging to the functions of independent work: the learning function is manifested in mastering the basic methods of chemical science. It includes: analytical abilities, ability to make calculations, correct knowledge of chemical language, flexibility of modelling, etc. The educational function is associated with the formation of some special qualities of personality. They are hard-working, able to overcome difficulties, persistent, self-confident. Developmental function - development of individuality and independence, intellectual abilities (self-control, selection of the main thing, formulation, reasoning, observation, sensitivity, etc.).

When preparing independent work on the subject of chemistry, it is compiled in the form of tasks and exercises, laboratory work, tasks on theoretical material depending on the specifics of the subject. When a chemistry student performs his work independently, homework can include tasks, exercises and theoretical questions on

various topics. When compiling an assignment for independent study, the course instructor should take into account the order in which the course is taught, the theoretical questions and problems, the relationship between exercises, the types of problems relevant to each topic, the degree of difficulty of the exercise. The teacher of the course should take into account the depth of the material taught, the order in which various reference materials are used, and the way in which the answers to the assignment are presented.

As an example, students in physical chemistry will describe the aggregate states of matter, taking into account the structure and bonding of substances in the subject aggregate states of matter: solid (amorphous and crystalline; polymorphism, lattice types), liquid, gaseous. Identification of basic formulae describing these states; laws of gases (Klaiperon-Mendeleev, Dalton, Amaga, Van der Waals), molecular-kinetic theory of gases. If a student has difficulties in solving problems or questions that he/she does not understand, he/she can turn to the teacher and get the necessary counselling. Although there are no laboratory works on this topic, using the theoretical material in practice, the student will have an opportunity to fully assimilate this material.

In independent studies on the topic "Use of Hess's law": methods of approximate calculation of heats of formation and combustion: use of the method of correction for chemical bond energies, heats of formation of organic substances; Tasks on calculation of heat effects of chemical reactions in solutions are given. After the lecture on this topic will be performed laboratory work "Determination of heat of dissolution of a well-soluble salt" with the help of educational-laboratory complex "Chemistry". Laboratory works on determination of temperature change of known salts during dissolution; determination of integral heat of fusion of known salts (by reference); calculation of calorimeter constant; determination of temperature change during dissolution of unknown salts; consists of such parts as determination of integral heat of fusion of unknown salts. When performing laboratory works the student independently collects and assembles laboratory equipment; learns to work with a calorimeter, calculate the constant of the calorimeter, build graphs and process the obtained data, thus not only develops skills and knowledge in laboratory works, but also combines theoretical knowledge with practice.

It is known that colloquium is a form of control of the student's own work, which is conducted in the form of an interview on the studied topics of the course in order to

determine the quality of mastering the study material. Therefore, students of the course can submit theoretical material on some topics orally.

It is known that in the independent work of the student it is necessary to create conditions for the disclosure of individual characteristics of students, the development of their thinking abilities. Therefore, it is better to prepare tasks for each subject individually for each student. This is directly related to the implementation of the model of organisation of students' own work. As a result, a creative personality of the student is formed, who in his professional activity has the ability to work, to study independently, to conduct scientific research, analytical thinking, can manage his actions, independently control the results of his work. [ 4, c.142].

Organised independent work of students on a scientific basis and work on the management of students' learning and cognitive activity provide their conscious activity, high educational and professional motivation, the quality of the learning process.

In conclusion, it is known that independent work increases the student's responsibility for his/her own learning, teaches him/her to determine the content trajectory of his/her learning and choose the methods used [5, p. 123].

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