# The Problem Of Formation Of Information Competences In Future Chemistry Teachers

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*Abstract: Today, one of the main conditions for ensuring the competitiveness of a higher educational institution is the level of professional competence of a university teacher, which determines the quality of training of future specialists. In the light of the modern reform of the education system, the introduction of information and communication technologies for competent teachers is taking place in higher education. Under these conditions, the problem of the formation of information competence of a student becomes a determining factor in future professional activity, in connection with this there is a need to determine information competence as an important component of the general professional competence of a modern specialist. Future chemistry teachers should have a system of knowledge and skills that make it possible to correctly use information technologies in professional activities, know the possibilities and options for using information technologies in chemistry classes, and determine their pedagogical expediency in the study of certain chemical processes and phenomena.*

*Keywords: information technology, teaching method, competence, information competence, professional activity, animation, presentation, educational experiment*

## 1. INTRODUCTION

Modern society is characterized by a number of features, which it includes the increased importance of intellectual work, focused on the use of information resources, to communication between individual specialists, to  the need that to solve global environmental, technological, industrial and educational problems through the joint efforts of specialists from different countries or from public organizations. Therefore, today a special role is assigned to updating the content of higher education.

In the history of educational practice, various forms and productive methods of organization training are known for the formation of the general competencies of a specialist. General competencies, directed to preparing and mastering special disciplines are formed in higher educational institutions in the students in the process of studying general education disciplines.

The requirements for the training of future specialists are growing from year to year, society is developing, and the informatization is taking place in all spheres of life. The ability to work with a computer does not go beyond the extraordinary, modern society makes high demands regarding the information competence of future and current specialists. A human will always

be a sought-after specialist in a particular area of employment, who knows how to competently work with modern information technologies.

The introduction of information technologies into the educational process allows students to form personal qualities, for example, information culture, which in the conditions of modern society is extremely necessary for a specialist of any profile. Information technologies are directed to organize such methods of students' activity as active and motivated search for information in an uncertain situation: divergent and convergent thinking; detecting a problem and developing a hypothesis, observation and experiment, analysis of the obtained results, assessment and forecasting on their basis of the development of the situation. The formation of the listed methods of activity affects favorably to the formation of the professional position of a chemistry teacher, to the formation of his value orientations, that is, to personal training (carried out in the course of theoretical and practical training).

In the professional training of bachelors, in particular chemistry teachers, one of the main components is competence in the field of information and communication technologies (ICT), that is, IC - competence. Based on scientific and methodological literatures, it can be argued that information competence is the main part of professional competence. In this regard, it is necessary to use modern methods in the educational process, in which information and communication technologies, Internet technologies, electronic textbooks; electronic educational environments are actively used, since it is no less important to form IC competencies in undergraduate and natural science students. Trained personnel possessing not only professional skills and competencies, but also IC competencies, are the most competitive in the labor market.

A modern lesson is impossible without the use of information and communication technologies, this is especially true for the disciplines of the natural science cycle. The widespread use of animation, chemical modeling by using a computer makes teaching more visual, understandable and memorable. The use of virtual excursions greatly expands the worldview of students and makes it easier to understand the essence of chemical production.

Education using the ICT is not only the communication of new information, but also it is the teaching methods of independent works, self-control, mutual control, methods of research activities, the ability to acquire knowledge, to generalize and draw conclusions, and to fix the main thing in a minimized form. At the base of teaching with the help of computer technology lies, first of all, a fundamentally new model of organizing student learning, which is of interest to any creatively working of teacher and allows you to get answers to previously asked questions.

Classes using the ICT are fundamentally different from the classical teaching system. This difference consists in changing the role of the teacher: he is no longer the main source of knowledge; his function is reduced to advisory - directing. This is due to the use of modern electronic textbooks, virtual chemical laboratories, the Internet, and new teaching aids. The task of the teacher is to choose these tools in accordance with the content of the educational material, the age and psychological characteristics of the students, as well as the ability of students to use a computer.

In teaching of chemistry, various options for their use are possible. Multimedia presentations and specialized software open up new perspectives in education in chemistry lessons. For example, a multimedia presentation allows to concisely and succinctly illustrate the teacher's thought. Animations built into the presentation, voiced fragments of video experiences make the material more accessible for perception. Assistant at all stages of the lesson involves updating knowledge, explaining new material, questioning, generalizing and systematizing knowledge.

It is impossible to study chemistry without experiment. The ability to conduct, observe, and explain a chemical experiment is one of the most important components of chemical literacy. Working in a chemical laboratory with substances and equipment is undoubtedly of paramount importance for developing experimental design skills. But information technologies in teaching of chemistry are indispensable if toxic or explosive substances are being studied, if there are no certain reagents in the laboratory of the chemistry room. In this case, the possibility of conducting an experiment in the virtual world is the only one.

For example, conduction of a qualitative reaction to the Ca cation was showed, a developed training program for a virtual chemical experiment in Figure 1. $Ca^{2+}$ cations form with ammonium oxalate $(NH_4)_2C_2O_4$ a white crystalline precipitate of calcium oxalate $CaC_2O_4 \bullet H_2O$, which is practically insoluble in water and acetic acid, but easily soluble in mineral acids. Performing a reaction. 3 drops of $CaCl_2$ solution are added to the test tube, a drop of acetic acid solution and 3 drops of ammonium oxalate solution are added. A white crystalline precipitate of calcium oxalate falls out. When organizing laboratory work in this way, the computer becomes an effective assistant. For example, when studying toxic substances (benzene, halogens, etc.), the virtual world makes it possible to conduct a chemical experiment without risking the health of students. With the help of electronic textbooks, video fragments of experiments are shown, which cannot always be carried out in a lesson in full, due to the lack of the necessary equipment.
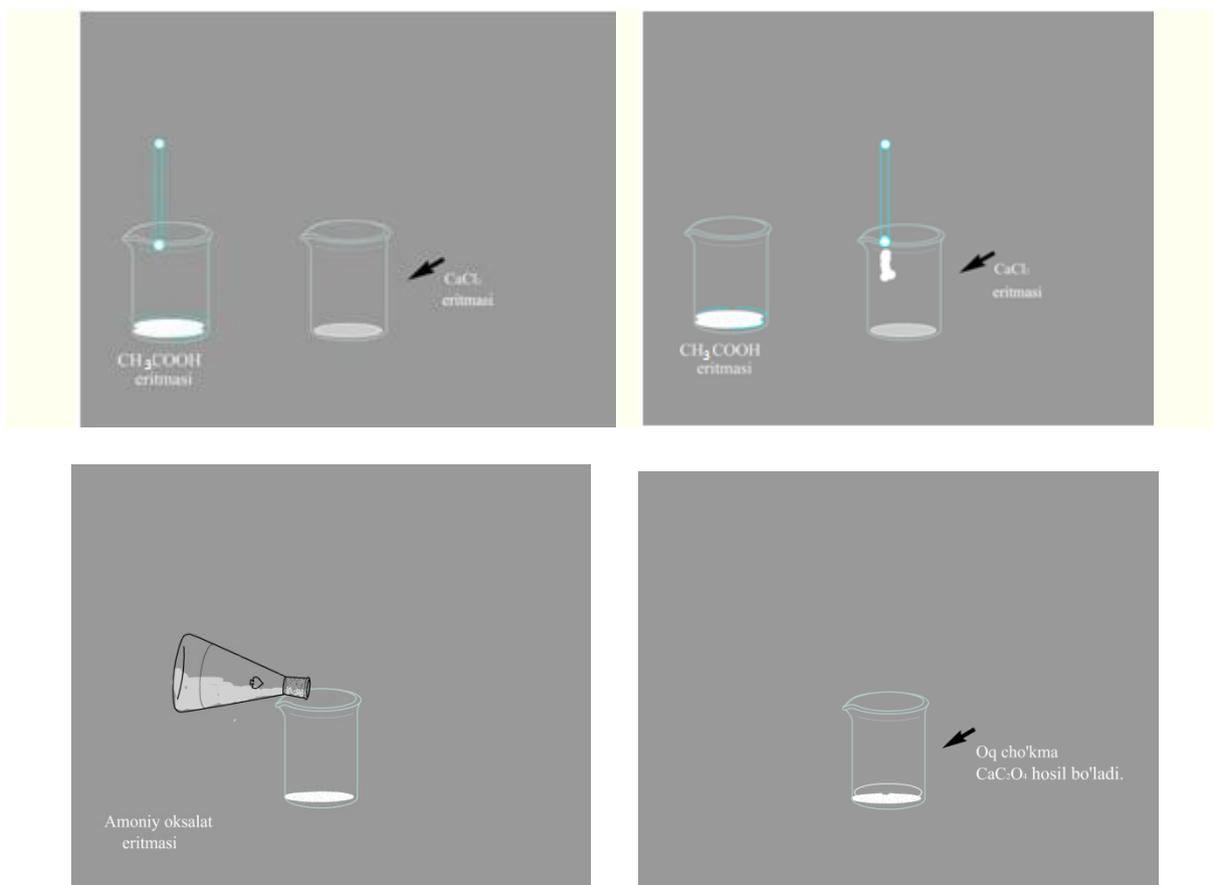


Fig. 1. Fragment of training program

Under the studying of chemistry, ICT can be used in different forms in various types of classes: during lectures, practical and laboratory classes, during self-preparation and for control the degree of mastering by students of educational material. We can also use other

types of information technologies – computer slides, animations, interactive tests, simulation of chemical processes, Internet capabilities, web quests, mind maps and others.


At the same time, for the competent and methodologically based application of information technologies, the most important tasks in teaching of  future chemistry teachers is the formation of their information competence. That is the equipping students with the ability to actively, independent processing of information by using technological means. In accordance with modern requirements for the education of future chemistry teachers at a pedagogical university, we offer a didactic system of continuous information and communication training, directed to the formation and development of students' information and communication competence. In this process, we pay special attention to the issues of continuity and sufficiency of informatization of teaching chemistry, integration of special, psychological, pedagogical and information disciplines.

As a component of key competence in teacher training, information competence involves the development of generalized types of human information activities (collection, search, storage, processing) based on the use of ICT.

As a component of basic competence – mastering the information activities, ways of using ICT in the educational process, in the professional and pedagogical activities of a teacher.

As a component of special competence – ensuring the teacher's readiness to use various types of information activities, ICT tools in subject methodology, in particular chemistry, to perform specific pedagogical actions, solving specific pedagogical problems and tasks.
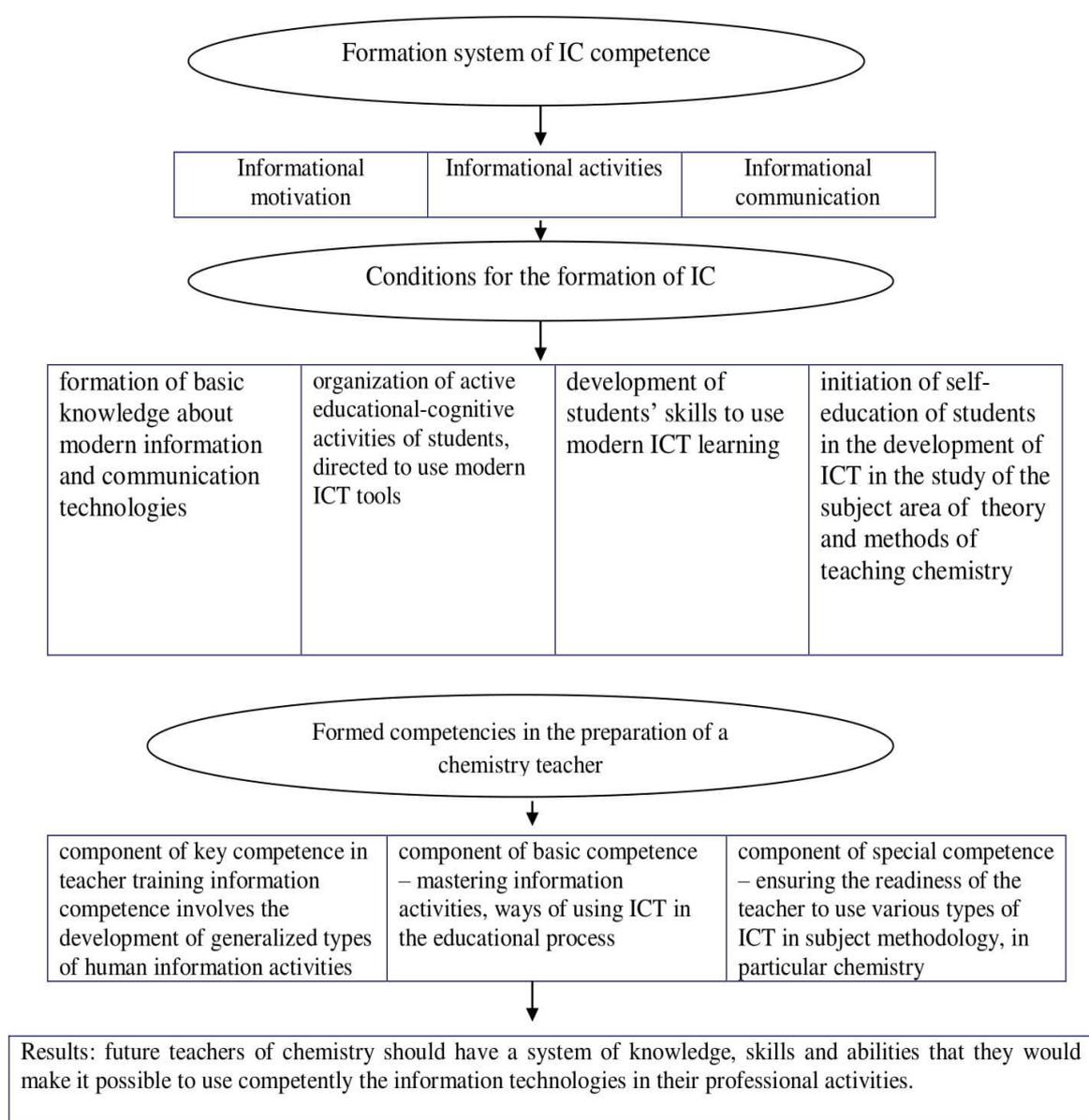
Modern chemistry teachers should be able to work in an electronic information and educational environment, to use ICT tools as additional and basic teaching materials to organize individual and group work of students; to develop web content, to use the web as a collaborative tool for students at school and out of school. The effectiveness of the formation of information competence of teachers is possible under the condition of targeted pedagogical influence and systematic interaction of subjects of the educational process in the regional information educational environment.

Taking into account the above, in our opinion, for the formation of IC – competencies in future chemistry teachers, it is necessary:

☐ formation of basic knowledge about modern information and communication technologies, necessary for the rational organization of the educational process in chemistry,

- organization of active educational and cognitive activity of students, directed  to use modern ICT tools to accompany the educational process in chemistry,

- development of students' skills to use modern ICT training for conducting training occupations,

- initiation of self-education of students in the development of ICT in the study of the subject area of  theory and methods of teaching chemistry.

The problem of forming the information culture of future chemistry teachers seems to be one of the most urgent today, since at the present stage of development of the education system, it is necessary to prepare graduates who are well versed in computer technologies and who are able to quickly navigate the information space. The need to develop the competence qualities of future teachers is due to the peculiarities of their professional activities, which reflects the specifics of professional thinking and the extreme complexity and multifunctionality of tasks (their heterogeneity, requiring the universality of knowledge, skills  and professional qualities).

The process of forming a teacher's information competence is an integral system that it includes informational motivation (the formation of motives and needs to work with information); informational activity (mastering the volume of knowledge, skills of working

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│      Formation system of IC competence    │
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| Informational motivation | Informational activities | Informational communication |
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│      Conditions for the formation of IC   │
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| formation of basic knowledge about modern information and communication technologies | organization of active educational-cognitive activities of students, directed to use modern ICT tools | development of students' skills to use modern ICT learning | initiation of self-education of students in the development of ICT in the study of the subject area of theory and methods of teaching chemistry |
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│   Formed competencies in the preparation  │
│         of a chemistry teacher            │
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| component of key competence in teacher training information competence involves the development of generalized types of human information activities | component of basic competence – mastering information activities, ways of using ICT in the educational process | component of special competence – ensuring the readiness of the teacher to use various types of ICT in subject methodology, in particular chemistry |
|---|---|---|

Results: future teachers of chemistry should have a system of knowledge, skills and abilities that they would make it possible to use competently the information technologies in their professional activities.

**Fig. 2. Model of the formation of IC competencies, among future chemistry teachers**

That is why, the formation of informational competence is one of the leading tasks of training a future specialist, because it permits laying the foundation for his self-improvement and self-development, readiness to "step by step with the times".

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