Enhancing Information-Methodical Competence: A Digital Approach for Chemistry Educators

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Keywords: Digital Technologies, Information And Methodological Competence, Organizational And Didactic Model, Principles, DTS Requirements, Competence.

Abstract: The article involves the methodological content of improving information and methodological competence in a digital educational environment and, on its basis, develops an organizational and didactic model for the development of information and methodological competence of a future chemistry teacher. The functions and principles of the process management system for increasing the information and methodological competence of future chemistry teachers are described.

1 INTRODUCTION

Digital technologies (DT) are rapidly developing and becoming more pervasive and innovative, giving way to digital materials and services. Educators have the opportunity to create, control and use their information spaces on the basis of mutual cooperation. Their opportunities to control themselves and each other, to increase their interest in learning, and to understand educational activities (for the student) are expanded. The traditional form and possibilities of organizing the educational process are narrowing. Directing the educational process individually, focusing on results, is one of the conditions for the effective use of pedagogical possibilities of DT and methodical decisions based on their use.

2 RESEARCH METHODOLOGY

Transformational processes in the field of education are developing all over the world. They are also very necessary and important for our local education. The digital economy requires every student (not only the best students) to acquire 21-century competencies (critical thinking, independent learning skills, the ability to fully use digital resources, resources and services in their daily activities), to creatively use existing knowledge in a rapidly developing digital environment. requires. The digital transformation of education should solve this problem. From this point of view, the organization of continuous professional-methodical development of chemistry teachers in the modern digital educational environment in accordance with the requirements of the new modern National curriculum requires unique approaches. On M. Isabaeva's view that "Increasing the quality and effectiveness of education will be achieved by modernizing the information and methodical competence of future teachers based on the requirements of modern science and technology development and developing their methodical competence known to advanced foreign experiences". The content of the research includes the State policy of the Republic of Uzbekistan in the field of education, responsibility and flexibility, information and communication technologies and media literacy, development of communicative skills, issues of introducing inclusive education, self-development, continuous professional development, relevant new knowledge and skills, the thoughts aimed at the formation of qualifications and competences have paid off.

The content of the educational modules used in the research work was formed on the basis of the content, quality and general qualification requirements for improving the informational and methodological competence of future chemistry teachers of general secondary schools and their training, and the effective use of modern knowledge and innovations in their professional activities,

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advanced foreign experiences of chemistry teachers. and it envisages the development of information and methodical competence due to increasing the level of wide application of information and communication technologies to the educational process.

3 RESULTS AND DISCUSSIONS

The transition to a competent approach in chemistry education and training places special demands on the professional and methodical training of the chemistry teacher. Modernization of information and methodical competence of chemistry teachers based on the requirements of modern science and technology development and development of methodical competence known to advanced foreign experiences is required. The National program, created on the basis of international foreign experiences, is based on a competent approach and sets the following tasks for the future chemistry teacher:

Expanding and systematizing chemical knowledge of chemistry teachers in accordance with the requirements of State Education Standards, continuously familiarizing with modern methods of teaching chemistry;

Overcoming obstacles in pedagogical activities related to the implementation of the national program, helping to eliminate shortcomings;

Getting acquainted with international experiences and experiences of advanced chemistry teachers in mastering modern methods of teaching chemistry;

Mastering modern digital technologies, methods, forms and tools related to the implementation of teaching in a digital educational environment;

In order to prevent difficulties in solving problems and exercises in chemistry, creating a methodical system, constantly getting acquainted with the system of tasks given in the newsletters of the state test center, etc.

The personal qualities of a chemistry teacher play an important role in the development of informational and methodical competence. The personal qualities of a chemistry teacher play an important role in the development of informational and methodical competence.

In particular, to develop organizational skills in cooperation with students and the community, to constantly analyze one's intellectual and professional activities, to be aware of the modern achievements of science in the field of chemistry, to constantly study modern digital technologies, methods, forms and objects of teaching and to apply them in professional activities, professional-psychological in order to get motivation, it is necessary to participate in psychological trainings, to acquire the competencies of organizing a competently oriented educational process.

As a result of our research, the following organizational-didactic model of the development of information-methodical competence of chemistry teachers in the digital educational environment was formed (Table 1).

In the modern educational environment, the future chemistry teacher acts as a subject of innovative activity, the creator of a unique social space, and ultimately determines the ways to achieve the quality of innovative development, its main vector and result.

Table 1: Organizational-didactic model of development of information-methodical competence of a chemistry teacher in a digital educational environment.

<table>
<tr><td colspan="3">I. Diagnostic analysis block</td></tr>
<tr><td colspan="2">Determining the necessary conditions for the development of information and methodical competence of a chemistry teacher in a digital educational environment</td><td>Clarification of modern methods that serve to develop the informational and methodical competence of the chemistry teacher in the digital educational environment</td></tr>
<tr><td colspan="3">II. Block of values</td></tr>
<tr><td>Reflection</td><td>Incentive</td><td>Goal setting</td></tr>
<tr><td colspan="3">III. Organizational block</td></tr>
<tr><td>Information-methodical module</td><td>Methods and tools</td><td>Organizational-methodical</td></tr>
<tr><td></td><td>Practical (use in practice)</td><td></td></tr>
<tr><td colspan="3">IV. Prediction block</td></tr>
</table>

Teaching methods form the basis of chemistry teaching and educational process in scientific-methodical literature. Teaching methods in the development of information-methodical competence of chemistry teachers in the digital educational environment direct the methods of student activity and teacher's activity to achieve the intended goal of learning. Any method used to teach new techniques:

- to the teacher’s professional activity;
- to develop students’ professional activities related to knowledge-learning and professional development;
- it is necessary to ensure the process of managing the cooperative activities of teachers and students.

It should be noted that the system of methods developed and used in practice in national centers for training chemistry teachers in new methods is used in harmony with general methods of teaching chemistry and modern methods of educational technologies. They are based on didactic and interactive methods. The passive, active and interactive methods used here can be widely promoted.

The methodical system of developing the information-methodical competence of the future chemistry teacher is formed after the formation of the contingent of students who need such knowledge. Therefore, the activity of students is a mandatory component of the methodical system of developing the informational and methodical competence of the chemistry teacher.

Taking into account that the system of developing the information and methodical competence of a future chemistry teacher cannot be realized without students, a teacher who has comprehensive information according to the goals of the lesson will be able to use the methodological, psychological-pedagogical and methodical aspects of teaching the methodology of chemistry teaching, and will be able to use the unique objects, methods and organizational forms of teaching adults and constitutes its pedagogical-methodical activity. Therefore, the activity of the teacher (student) is a necessary component of this system.

Undoubtedly, the ultimate goal of the system of improving the information and methodical training of the chemistry teacher is the formation of professional competence for the implementation of pedagogical activities in each student during the teaching process, that is, it is necessary to achieve a certain result in accordance with the intended purpose of the lessons. Thus, the obligatory and final component of the system is the result of the lesson, which is the development of informational and methodical competence of the future chemistry teacher.

In connection with the introduction of a new component, that is, as a result of the formation of the student's professional competence in the implementation of pedagogical activities in the teaching of chemistry, we need to clarify the concept of “professional competence”. By “competence” we mean the listener's ability and opportunity to carry out professional-pedagogical activities based on his existing "integrative knowledge, skills and qualifications, a special working situation of a student (subject of education) who has a specific professional action pattern and the idea of regularly performing it”.

On the other hand, the competence to carry out professional-pedagogical activity should not be understood as the completed and improved level of the formation of integrative knowledge, skills and competencies operating in the system of information-methodical competence development of the future chemistry teacher. Competence has a developmental character as an indicator of the result of teaching chemistry, it is expressed in the solution of specific pedagogical and creative issues at each stage of the educational system. In the process of mastering the specified integrative knowledge, skills and competencies, at each stage of training, the competence of the student to move to the next stage is evaluated. Therefore, competence is not only the final value of the system, but also the universal quality of the student's condition at each stage of the professional-pedagogical system of the educational process. At the same time, competence as a condition is determined by the possibility and ability of the future chemistry teacher to optimally perform the intended pedagogical tasks.

It is worth noting that the components of the educational process of the future chemistry teacher as a system are as follows: goal (content), methodical means of communication, activity of the student (pupils), activity of the teacher, result. The interdependence of these components is necessary to evaluate the educational process of a chemistry teacher. If one of the above-mentioned components is excluded from the system of information-methodical competence development of a chemistry teacher, it will lead to a violation of the management system. For example, the shortcoming of most theoretical models of pedagogy (didactics) and methodology is that they cannot achieve the expected result.

Based on the above, it should be noted that the course of lessons includes components such as goal orientation, intensity of independent activity.

Thus, it is possible to emphasize the functions related to the management of the learning process, which allows the implementation of student abilities. We divide all the functions of the lesson process management system of future chemistry teachers into educational and organizational types (Table 2).

Table 2: Functions of the management system of the process of improving the information-methodical competence of future chemistry teachers.

Functions of the management system of the process of improving the information-methodical competence of future chemistry teachers	
Educational functions	Organizational functions
• To provide conditions for improving informational and methodical skills in separate subjects of chemistry programs in school and higher education;	to introduce working plans and programs to future chemistry teachers in order to form information-methodical competencies in classes;
• providing students with the necessary conditions to improve their skills in various fields of chemistry teaching methodology within the current programs of science;	achieving the optimal goal of education in interaction with the subjects of the lesson process;
• creating an optimal learning environment based on active and interactive forms of teaching;	achieving mutually effective cooperation of subjects of the learning process;
• providing conditions for the student to communicate with the teacher and fellow students.	achieving effective control and evaluation of student activities during the teaching process;
	make adjustments to the training plan as needed.

In order to create a fully functional process of the educational system, it is necessary to develop scientific-methodical and organizational-technological principles and to ensure mutual balance between them (Tab. 3).

Table 3: Principles of effective organization of the process of teaching chemistry.

Scientific and methodological principles:	Organizational and technological principles:
- selection of didactic principles of chemistry teaching methodology;	- principles of determining forms, types and forms of mutual cooperation between students and teachers;
- the principles of creating the process of teaching lessons and providing it with didactic materials	- principles of choosing a suitable program of digital technologies and sciences.

It should be noted that the organizational-technological and scientific-methodical principles of teaching processes in the higher education system are closely related.

Thus, the choice of teaching methods in most cases depends on their form, and the chosen digital technology should be determined based on their classification. We can consider different types of interaction between teachers and students (Table 4).

Table 4: Ways to ensure interaction between teachers and students in a digital learning environment.

Teacher	Mutual cooperation (entity-entity) relations	A student
formation of personality-oriented skills in students	on the basis of cooperation in small groups, in the form of dialogue between subjects	orients their activities to learning outcomes
teaching content is not ready-made, that is, it is presented in a digital environment in the form of a collection of knowledge or information	In the process of students' work individually, in pairs or in small groups, a comfortable digital learning environment is formed, dialogue is effectively used	conclusions are made by analyzing and discussing them
active interaction between the teacher and the student group	interactive interaction	mutual reflexive cooperation between students

Teaching of chemistry is more focused on acquiring practical skills rather than acquiring theoretical knowledge.

This form of mutual cooperation is characterized by the formation of new programs prepared on the basis of information technologies. The goals and objectives of the lesson are reviewed, modified and discussed with the participation of the teacher and students. The goals and objectives of the lesson are not aimed at acquiring theoretical knowledge, but at forming personal skills in students. In the preparation process, students direct their activities to learning outcomes. The work of mutual cooperation is manifested in the form of dialogue between subjects based on cooperation in small groups.

The teaching process is formed in a comfortable environment during the work of students individually, in pairs or in small groups. In this case, the teaching content is given in the form of a collection of knowledge or information, and conclusions are made by analyzing and discussing them. In this form of interaction, the student and the teacher actively participate in the teaching process. In the teaching process, dialogue is used effectively, and evaluation takes an important place, and the student can get advice on the questions he is interested in, and

the teacher makes adjustments to the lesson plan based on the results of the lesson process. This form of interaction is implemented in the person-oriented education system

In this form, it implies not only the active interaction between the teacher and the group of students, but also the interaction between students. Since the above-mentioned interaction is very effective in the teaching process, it is called an interactive form of teaching in the teaching methodology. This form of teaching can be reflected in the process of using “game technologies”, “project methodology”, “problematic teaching” and other technologies.

Innovative pedagogical technologies can be implemented maximally effectively if all the above-mentioned forms of interaction between teachers and students are harmoniously used in the course of the lesson. The use of these methods and methods in a specific situation in the teaching process, as well as adherence to the balance between them, is one of the first-level issues. The use of specific methods and methods of teaching depends on the selected pedagogical technologies and the level of training of the teacher.

According to M.I. Makhmutov, “teaching methods (tools, methods, information methods, management and control of students' cognitive activities), learning methods (tools, methods, methods of mastering educational material, productive and reproductive methods of learning and self-control) and their interrelationship play great role, “teaching methods” means the transformation of teaching and learning goals at one or another stage of teaching in the implementation of the goals of teaching, upbringing and development of students based on an orderly set of didactic methods and tools.

Modernization of pedagogical education has created the need to create an effective and highly functional mechanism.

Many educators around the world emphasize the importance of project-based learning (PE) in the learning of chemistry, both in and out of the classroom [6]. Project-based learning allows students to acquire and develop academic skills and content knowledge. This educational approach provides students with the skills necessary for future success and the personal freedom needed to deal with critical life situations. Meanwhile, various models and guides for PE have been developed by experts and organizations in recent years, designed to provide a common framework for teacher development worldwide.

4 CONCLUSION

In order for any educational process to be effective, it should be able to meet the interests and needs of the learner. This applies to learners of all ages. Students usually attend classes in order to learn new things, learn new teaching methods and technologies, and satisfy their professional needs. However, each student's academic needs are different. This is a natural state. A topic presented to 25 students gathered in one audience may be interesting for someone, meet the needs of someone, and not at all useful for the rest. In the end, the student will not be equally satisfied with the course. For this, it is necessary to study the needs of students to improve their inventive-methodical competence, to create an individual inventive-methodical development trajectory for each of them.

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