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**DIDACTIC POTENTIAL OF INFORMATION AND EDUCATIONAL ENVIRONMENT  
FOR THE ORGANIZATION OF MODERN LEARNING PROCESS**

ДИДАКТИЧЕСКИЙ ПОТЕНЦИАЛ ИНФОРМАЦИОННО-ОБРАЗОВАТЕЛЬНОЙ СРЕДЫ ДЛЯ  
ОРГАНИЗАЦИИ СОВРЕМЕННОГО ПРОЦЕССА ОБУЧЕНИЯ

ЗАМАНБАП ОКУУ ПРОЦЕСИН УЮШТУРУУ ҮЧҮН МААЛЫМАТ-БИЛИМ БЕРҮҮ  
ЧӨЙРӨНҮН ДИДАКТИКАЛЫК ПОТЕНЦИАЛЫ

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## DIDACTIC POTENTIAL OF INFORMATION AND EDUCATIONAL ENVIRONMENT FOR THE ORGANIZATION OF MODERN LEARNING PROCESS

### Abstract

The article discusses the possibilities of the information and educational environment for organizing the learning process that meets the needs of the information society. The classification of environmental resources is presented, the structure of the electronic textbook as a means of mastering the content of education is determined, the problems arising during training in the information and educational environment are identified. The authors of the article describe the optimal didactic capabilities of modern information technologies to be used to improve the preparedness of a chemistry graduate. The aim of the article is to highlight the problem of finding the optimal didactic capabilities of modern information technologies used for improving the system of training specialists in the field of chemistry and to discuss the results of current studies in this direction.

**Keywords:** information and educational environment, learning process, subjects of education, electronic textbook.

**Дидактический потенциал информационно-образовательной среды для организации современного процесса обучения**

### Аннотация

В статье рассматриваются возможности информационно-образовательной среды для организации учебного процесса, отвечающего потребностям информационного общества. Представлена классификация ресурсов среды, определена структура электронного учебника как средства освоения содержания образования, выявлены проблемы, возникающие при обучении в информационно-образовательной среде. Авторы статьи описывают оптимальные дидактические возможности современных информационных технологий, используемых для повышения подготовленности выпускника химического вуза. Целью статьи является освещение проблемы поиска оптимальных дидактических возможностей современных информационных технологий, используемых для совершенствования системы подготовки специалистов в области химии, и обсуждение результатов современных исследований в этом направлении. Переведено с помощью [www.DeepL.com/Translator](http://www.DeepL.com/Translator) (бесплатная версия).

**Ключевые слова:** информационно-образовательная среда, учебный процесс, субъекты образования, электронный учебник.

**Заманбап окуу процесин уюштуруу үчүн маалымат-билим берүү чөйрөнүн дидактикалык потенциалы**

### Аннотация

Макалада маалыматтык коомдун муктаждыктарына жооп берген билим берүү процесин уюштуруу үчүн маалыматтык-билим берүү чөйрөсүнүн мүмкүнчүлүктөрү талкууланат. Экологиялык ресурстардын классификациясы көрсөтүлүп, электрондук окуу китебинин түзүмү билим берүүнүн мазмунун өздөштүрүү каражаты катары аныкталып, маалыматтык-билим берүү чөйрөсүндө окутууда пайда болгон көйгөйлөр аныкталган. Макала авторлору оптималдуу дидактиканы сүрөттөшөт. химиялык университеттин бүтүрүүчүсүнүн даярдыгын жогорулатуу үчүн колдонулган заманбап маалыматтык технологиялардын мүмкүнчүлүктөрү. Макаланын максаты - химия тармагында адистерди даярдоо системасын өркүндөтүү үчүн колдонулуп жаткан заманбап маалыматтык технологиялардын оптималдуу дидактикалык мүмкүнчүлүктөрүн табуу көйгөйүн көрсөтүү жана бул багыттагы заманбап изилдөөлөрдүн натыйжаларын талкуулоо.

**Ачкыч сөздөр:** маалыматтык-билим берүү чөйрөсү, билим берүү процесси, билим берүүнүн субъекттери, электрондук окуу китеби.

## Conducting

In the information society, education is becoming in demand, ensuring the development of creative, creative capabilities of a person, his knowledge and skills to operate with them, constantly update them, expand and produce new ones. Education of a new quality is provided by the presence of an information space that allows each person to receive information to the extent that he needs for self-development and self-improvement. This phenomenon is already being investigated by didactics in order to determine the conditions for the effective use of the new opportunities for human learning.

The effectiveness of the process largely depends on how much learning is based on the personal subjective experience of students. Schoolchildren grew up in a situation where the virtual information space is an integral part of everyday life. Today, it is much clearer and closer for students to acquire knowledge with the help of information and communication technologies (ICT) – after all, since childhood they have been accustomed to looking for answers to all questions on the Internet. The results of sociological research give grounds to conclude that "as a teenager grows up and as he develops the information environment, he increasingly has to resort to the use of ICT tools to solve various problems and tasks – everyday, educational, personal, etc." The goals for which schoolchildren use a computer, in particular, are as follows: "to prepare for lessons, in addition to computer science" (38.9%), "to prepare for computer science lessons" (15.7%), "to acquire new knowledge, information" (23,1%)" (Adamchuk D.V., 2010). These data indicate that the use of educational opportunities of the information space is one of the ways to increase the effectiveness of the learning process, while the learning potential of the resources of the space (portals, websites, etc.) is variable.

The information and educational environment (IEE) is of greater importance for the creation of a modern educational process. We consider it as a set of information, methodological and technical resources created by the subjects of education, ensuring the achievement of the goals of education and upbringing (including self-education).

The didactic potential of IEE is related:

1. With a personal setting of the environment. Each of the subjects builds an environment in which the content and structure correspond to its educational goals;
2. With the capabilities of the IEE to individualize not only the content of the educational material, but also the ways of working with it at all stages of the didactic cycle, which is considered as a unity of interrelated elements of the learning process, its structural unit having all the qualitative characteristics of the process (V.V. Krayevsky, I.Ya. Lerner., 1989);
3. With the interactivity and communicativeness of the IEE, ensuring constant interaction of participants in the educational process with each other and software.

We will reveal in more detail the designated capabilities of IEE in the organization of the learning process.

The personal setting of the environment can be viewed from several positions. First of all, it is necessary to take into account that the IEE is created by the subjects of the educational process for their own purposes. These subjects can be teachers, students, parents, or there can be collective subjects – for example, pedagogical collectives of schools, associations of teachers, professional communities. As a result, both individual environments (student, teacher) and collective ones are formed (IEE schools, portals for teachers on subjects, on the use of ICT tools,

etc.) In this case, the formation of relevant content for each subject, presented in a form convenient for him (text, sound, animation, graphics, etc.), and the means of working with it. For example, a virtual portfolio can store not only all the work done by a student, but also the materials that he used in his work, grades and comments from teachers and classmates. The second aspect, which is significant for improving the quality of the learning process as a whole, is related to the fact that the IEE provides orientation to the individual educational needs of students. Students can implement individual trajectories of mastering educational programs, get an assessment of their results, including with the help of ICT, be in interaction with teachers and comrades. The communicativeness of the IEE allows you to organize the process of joint solving of educational tasks, to exchange information. The use of IEE allows the student not only to assign the information transmitted by the teacher, but also to consciously set their own goals of activity, mediating external goals set by the teacher; independently determine the need for information, evaluate, transform it, produce knowledge, apply it in accordance with the goal; be aware of their responsibility for the results of activities, make moral choices in situations of uncertainty. Skills to work in a team (including virtual), qualities of tolerance, self-esteem are developing (Adamchuk D.V., 2010).

Undoubtedly, the use of IEE by teachers for their professional purposes is significant for the learning process. The variety of resources that a teacher can use is truly limitless. They can be divided into several groups:

1. Resources containing specific methodological guidelines that can assist the teacher in conducting the lesson and in its development. This group includes resources that affect both the substantive and procedural components of learning.

2. Resources that provide recommendations for the development and conduct of lessons, very often of a didactic nature, without division into academic subjects. For example, the site "Window into situational teaching methodology", the portal "Didactor", the site "Active video" and many others. This group also includes those resources that contain "blanks" for the preparation and conduct of the lesson – texts, presentations, individual drawings, full-text textbooks, etc.

3. Resources that allow students to evaluate the results of mastering the content of education without the participation of a teacher – tests, simulators. Often, on these sites, teachers can not only use ready-made ones, but also develop their own tests by inserting them into a template.

4. Resources that provide an opportunity for a broad professional discussion of problems, their own professional growth. An example is numerous network communities of teachers, such as "Open Class", "Network of Creative Teachers", "Pedagogical Internet Club".

5. Resources (combined) that provide all or part of the above-mentioned opportunities.

In this case, the quality of the learning process increases due to the selectivity of the teacher himself, his desire to make the lesson the most attractive for students. But not unimportant is the pedagogical expediency of using IEE, the readiness of teachers and students to work with them. The interactivity of IEE in the learning process enables students to interact with the elements of the environment to achieve their cognitive goals. In the learning process, in addition to the two actors – the teacher and the student, another element has appeared – the IEE, which can have a significant impact on the course and results of learning. The learning process is built with the obligatory use of feedback, based on the possibilities of

interactive interaction of various types and levels. Organized by interactive dialogue that involves "user interaction with the software system. At the same time, it is possible to choose the options for the content of the educational material, the mode of operation" (Robert I.V. (2012).

The following types of interactivity are present (in various combinations) in the learning process:

- binary interactivity – person-person, person-ICT-learning tools (multimedia program);
- synchronous and asynchronous interactivity (on-line, off-line);
- subject interactivity: teacher-student, teacher-group of students, student-student (group).

The IEE partially performs the functions of organizing educational activities (for example, when working with resources created specifically for training in order to consolidate and test knowledge (testers, simulators, survey systems, etc.), where the program evaluates the answer – correct/ incorrect) (Edited by O.B. (2012).

The special significance and necessity of didactic consideration of interactivity as a characteristic of the learning process is given by the clear advance of technical developments in the field of ICT technologies in comparison with their pedagogical comprehension. The use of an interactive whiteboard in classrooms often turns into a teacher's goal in itself, into a criterion for the effectiveness of his work. At the same time, the number of techniques used and their variety lead to the fact that students are not trained to work with information, but perceive the lesson as an element of entertainment.

Communicativeness as a characteristic of the learning process, providing a field of communication interaction for the subjects of the educational process, is an integral component of interactivity. The communication capabilities of IEE are especially significant today, since the renewal of knowledge and the growth of their volume are so great that knowledge, even in a narrow area, cannot be mastered alone. People are increasingly using collaborative activities to get information. IEE provides network interaction (subject or non-subject), in which students with different cognitive priorities work as a whole, as a collective consumer and producer of knowledge (Ivanova E.O., Osmolovskaya I.M. 2011).

The possibilities of IEE for individualizing the learning process are associated with the multimedia nature of educational resources, which implies the expedient joint use of several means of transmission information, such as text, sound, image, animation, video, which allows you to visualize various kinds of processes, phenomena, events, dependencies, etc. The learning process in this case is based on the channels of perception and memorization of information (vision, hearing, touch (3-D printers), types of thinking (visual-figurative, verbal-logical, abstract-logical). The educational material appears as a colorful, voluminous, multifaceted image of the studied object, which ensures the formation of associative connections that contribute to its better assimilation (Osmolovskaya I.M., 2009).

All of the above possibilities of organizing the educational process in the IEE can be realized only with the pedagogically appropriate use of existing resources and technologies, as well as with the development of special tools for organizing work with the IEE. The information space is increasingly being used by the subjects of education independently, and, as a result, education largely becomes the result of independent cognition. Students, when formulating their educational requests, have the opportunity to receive and use information from different

sources, presented in various forms and types. In this regard, the tasks of organizing students' knowledge, arming them with effective strategies for finding and using information are relevant for the school (Osmolovskaya I.M., 2009)

And here the problem of developing a new generation textbook comes to the fore, which, on the one hand, would organize the activities of students, and on the other hand, would allow them to independently "design" their own educational route. Obviously, it will be an electronic textbook – an educational electronic publication in which the subject is systematically and fully described in accordance with the educational program. Electronic textbook – "it is an information system of complex purpose, providing ... the implementation of the didactic capabilities of ICT tools in all parts of the didactic cycle of the learning process:

- setting a cognitive task;
- presentation of the content of the educational material;
- organization of the application of primary acquired knowledge (organization of activities for the performance of individual tasks, as a result of which the formation of scientific knowledge occurs);
- feedback, monitoring of students' activities;
- organization of preparation for further educational activities" (Batrakova L. G., 2012).

The electronic textbook has all the main characteristics of IEE: openness, provided through interaction with the information and educational space; integrity, i.e. internal unity of components; multifunctional, since the textbook acts as a source of knowledge and at the same time as a means of organizing various forms of cognitive activity of students; purposefulness, since it is created with a specific purpose - learning in the conditions of IEE; interactivity, providing opportunities for interaction between participants in the educational process and ICT.

The electronic textbook can be considered as the main element of the IEE, contributing to the assimilation of the invariant component of the content of education and the definition of variable content by students in accordance with their educational needs, providing a variety of forms and methods of teaching in the independent and group work of students using ICT. Particular attention, from the point of view of didactics, should be paid to the development of the assimilation apparatus in the textbook. It should include:

- navigation system (hyperlinks to textbook material, links to online educational resources);
- visual aids (graphs, diagrams, pictures, animation, multimedia materials) that will provide visualization of educational information;
- interactive tools for training and self-control, for mastering information (virtual laboratories, time tapes, interactive maps, etc.) (Edited by O.B. 2012).

In accordance with these provisions, the following blocks should obviously be presented in the electronic textbook:

- an information block in which the invariant content of education and its variable expansion will be placed (using hyperlinks);
- organizational and procedural block, including variatively constructed tasks aimed at assimilation of information (both invariant and variable components of the content of education), as well as means of evaluating the results of these works;

- personal (personal account), which can be built on the principle of a student's portfolio (collector, working materials, reflection) and may include ICT – means of organizing their own knowledge;
- communicative (interactive), providing a field of informational and evaluative interaction with both the teacher and fellow students;
- pedagogical, which will allow the teacher to constantly monitor the cognitive activity of students.

The analysis of this problem has shown that when creating such a textbook, a constructivist approach to the organization of training comes out in the first place. The following provisions are leading in this case:

- cognitive activity is an active process of students constructing their new knowledge based on previously formed personal experience;
- personal experience arises as a result of intellectual, cognitive activity of the student;
- learning new things requires activity in the field of social communication;
- the effectiveness of mastering the content of education depends on the conditions created for each student to realize their value preferences, intellectual and psycho-physiological capabilities, individual "vision" of the situation and ways to solve it.
- Considering the didactic possibilities of IEE for the organization of the learning process, it is impossible to ignore the question of the already manifested negative consequences of the widespread use of information resources. These include, in particular, the fact that:
  - unreliable, unverified, false information, which is often posted on the web, can lead to the formation of erroneous knowledge of students, or to the development of socially taboo moral qualities of a person;
  - a large amount of information makes it difficult to understand it until the information skills of students are formed: the skills of searching, assessing reliability, selection, comprehension, assignment at a new level (translation into knowledge), presentation, storage, transmission of information;
  - the ability to get answers to all questions without making their own efforts leads to cognitive dependency, and, as a result, the underdevelopment of the cognitive forces of the individual;
  - the simplicity of obtaining information leads to a "superformalism" of knowledge, when students, while performing a teacher's task, mechanically reproduce completely unconscious, not understood by them material taken from the information space;
  - teachers are often carried away by the new opportunities that IOS provides them, and do not clearly realize the set goals of training, education and development;
  - the multiplicity of information sources contributes to a change in the perception of the teacher as the main carrier of knowledge, which, if the teacher is not ready to play the role of a guide and systematizer, negatively affects the results of the learning process (Adamchuk D.V. 2010).

It can be assumed that these shortcomings are related to the lack of development of the psychological and didactic foundations of teaching in the IEE. It is necessary to find answers to the questions: how to teach and organize the cognitive activity of students in conditions of mass access to the global network? What should be the content of education that ensures, on the one hand, the implementation of the State Educational Standard, and on the other – taking into

account the individual interests and educational needs of students? What should textbooks become that organically link the possibilities of the information space and the requirements for the development of educational programs.

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