INFORMATION AND INNOVATIVE TECHNOLOGIES IN THE TURBULENCE ERA

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PREFACE

The development of information technologies and the widespread use of information resources, which are the result of the intellectual activity of the most educated part of society, have determined the necessity to create a framework for their successful use. That is why the development of certain methodological approaches to the use of new information technologies for the implementation of ideas in education, economics and management is currently relevant. It is these issues that the monograph, “Information and Innovative Technologies in the Turbulence Era” is devoted to.

The value of information and the sharing of information services continues to grow on a daily basis in our world. It can arguably be said that the primary role in the process of informatization is played by the information itself, which by itself does not produce any material value. Information is factual data and the body of knowledge concerning the relationship between said data: i.e. a means by which society can be aware of itself and function as a whole. Information must be both empirically verifiable and accessible so it can be received, understood and assimilated. The data taken from the information must be significant and correspond with the latest scientific parameters.

The monograph "Information and innovation technologies in the era of turbulence" consists of two parts: "Contemporary information and innovative technologies in education in times of turbulence" and "Modern technologies in the economy and management in conditions of turbulence".

The works presented in the first part of the monograph deal with several problems; teaching people of various ages, developing their creative potential, developing the ability to predict the results of activities and developing a strategy for solving problems, both educational and practical. Issues related to the fields of psychological, pedagogical and methodological developments aimed at identifying the optimal conditions for using the means of new information technologies in order to fortify the educational process while also considering an increase in both efficiency and quality.

The articles contained in the second part of the monograph relate to the possibilities of implementing the technical and software tools of modern information technologies in economics and management. The benefits of this allow ensuring the management of information flows, communication with the user in natural language, recognition and classification of images and situations, the effective development of the logic and argumentation of evidence, the accumulation and use of relevant knowledge, the organization of various forms of activities, making independent discoveries, etc.

Information and innovative technologies in the economy and management stimulate the development of business, local economies and start-ups. They offer new financial products and services and change the way people live. The problems of modern innovation management, based on identifying the causes and relationships that can arise in the activities of systems from fleeting changes in the environment as well as global phenomena and events, are considered. Without the constant introduction of innovations into the processes of any organization, its life cycle is sharply reduced and it becomes practically impossible to achieve the goals in general and at each stage of any activity in particular.

The central importance of information technology is based on three key conceptual foundations in strategic theory: the competitive forces of the system, the structure of the value chain, and the market hierarchy frame. Information technology can create significant and sustainable competitive advantages by changing the nature of competition: reshaping industries, creating new advantages, and spawning whole new businesses. Transactional information technologies are those systems where technology is used to ensure the quality of other activities. Information technology plays an important role in the restructuring and creation of market sectors.

The presented monograph is not an exhaustive source of theoretical and practical information on the above issues. At the same time, the information provided in the publication will be useful to the international community of educators, psychologists, educational methodologists, leaders of various levels, economists, and managers.

Editors

Part 1. INFORMATION AND INNOVATIVE TECHNOLOGIES IN EDUCATION

1.1. ORGANIZATION OF ONLINE EDUCATION IN PHYSICS AT SCHOOL USING MODERN INFORMATION TECHNOLOGIES

In the conditions of global informatization of society and all its spheres of life, the question of the effectiveness of the use of information and communication technologies in the field of education becomes important. In recent years, remote learning of physics at school is gaining more and more importance and development in Ukraine due to quarantine measures in connection with the Covid-19 pandemic and the war with the Russian Federation.

Distance education is a form of education equivalent to full-time, evening, extramural and externships, which is mainly implemented using distance learning technologies.

Distance learning technologies consist of pedagogical and information technologies of distance learning.

Pedagogical technologies of distance learning are technologies of mediated active communication between teachers and students using telecommunications and the methodology of individual work of subjects of learning with structured educational material presented in electronic form.

Distance learning information technologies are technologies for creating, transferring and saving educational materials, organizing and supporting the educational process of distance learning using telecommunications[1].

Distance learning is understood as an individualized process of transformation and assimilation of knowledge, abilities, skills and ways of cognitive activity of a person, which takes place through the mediated interaction of remote participants of learning in a specialized environment, which is created on the basis of modern psychological-pedagogical and information-communication technologies[2].

Distance physical education is a form of education that is self-sufficient for obtaining high-quality education in physics, which differs from other forms in the way of obtaining (providing) education, or the nature of educational communication, carried out mainly at a distance.

Distance learning of physics involves the interaction of a physics teacher and students with each other at a distance, carried out by means of information and telecommunication technologies, which allows the realization of educational goals, the use of pedagogical methods, and the use of various remote forms of organization of the educational process.

One of the main features of distance learning is the opportunity for the student to obtain the necessary knowledge himself, using advanced information resources provided by information technologies. Information resources (databases and knowledge bases, computer, including multimedia control learning systems, video and audio recordings, electronic libraries) together with traditional textbooks and methodical manuals create a unique distributed learning environment available to a wide audience.

The use of computer technologies does not change the period of study, and most often the use of electronic educational programs in the lesson requires more time, but gives the teacher the opportunity to more deeply illuminate this or that theoretical issue. At the same time, the use of multimedia resources helps students to delve into those physical processes and phenomena in more detail, to study important theoretical questions that could not be studied without their use.

Distance learning can be organized using a live video conference, in real time, that is, online is the most popular and effective type of learning, in the process of which the teacher and students can see each other, communicate, ask questions, and answer. The teacher can monitor everyone's activity, see how well the lesson material is being learned, and focus on those points that are difficult

[1] Концепція розвитку дистанційної освіти в Україні.
[2] Ibidem.

for students to understand. This type of training is more often conducted using ZOOM, Google Meet, Microsoft Teams, Skype and other platforms.

The main goal of the modern education modernization strategy is to achieve its new quality, which will correspond to the socio-economic situation, as well as the main directions of the state's development.

One of the key factors of success is the activity of a professionally and informationally competent teacher, the use of innovative methods and approaches in education, research activity, responsibility and initiative, the ability to adapt to a changing situation.

The main conditions and mechanisms of the learning process, as well as the structure of educational activity, are most fully described by the system-activity approach. When teaching physics, this means the following: the surrounding world is an object of knowledge for students, has a systematic organization. Any investigated physical object is considered, on the one hand, as some complex system consisting of separate interacting elements. On the other hand, this system, which is part of a more general system, interacts with other systems, that is, with the environment. The object studied in physics cannot exist outside of systems. The approach to the study of such objects is called systemic. The new standards of general secondary education include an active approach to education. According to this approach, the main thing in education is the question of what types of activities the student needs to master to solve the tasks that will arise before him in the future. As a result of training, the student must acquire generalized skills and master rational methods of activity. With this approach, the results of school education should be the ability to learn and learn about the world, organize joint activities, investigate problem situations, set and solve tasks.

An active approach to the study of physics orients students not only to the assimilation of individual concepts, provisions and laws of physics, and knowledge in general, but also to the methods of this assimilation, to the development of the student's creative potential. The activity is considered as a process of personality development through several consecutive independent actions of the student.

In the process of learning physics, the student must acquire personal experience considering the socially produced experience of previous generations. Knowledge is not self-sufficient – it is not the main goal of physical education, it plays only a secondary role, acting as a means of learning. At the same time, the teacher's goal is the organization of students' activities in solving practical problems, the formation of the most rational methods of activity that will ensure the solution of specific tasks by this individual in the future.

The signs of the modern educational process are its further humanization, democratization, intellectualization, increasing the role of the student's personality in the organization and conduct of educational activities.

Problem-based learning aims to develop students' creative abilities, which is one of the elements of the general intellectual development of schoolchildren.

So, problem-based learning is, on the one hand, mandatory, and on the other, an integral part of the educational process. Therefore, it is necessary to establish the signs of problematic learning, its place in the modern educational process in the process of learning new material.

The solution of this task is facilitated by the selection of units of the researched content and learning process[3].

The content unit of the educational subject should reflect the structural units of physical scientific knowledge. These structural units correspond to the components of the content of the school physics course: physical phenomena and processes, quantities, laws, theories, fundamental physical experiments, devices and technical devices, rational methods of activity.

Each component can be described through a system of statements about its essential features – a block of structural elements. Mastering the block ensures the creation in the minds of students of a complete, integral idea of the studied component. The content component of the school physics course is its unit.

[3] Каленик В. І., Каленик М. В. Питання загальної методики навчання фізики / Пробн. навч. посібник. – Суми: РВВ СДПУ ім. А. С. Макаренка, 2000, –125 с.

The content of the block can be in the text of one or several (not always placed one after the other) paragraphs of the textbook. Therefore, the teacher sometimes needs to reconstruct the content of existing physics textbooks.

Knowledge and assimilation of the content of the component takes place in the cycle of educational classes, which includes solving a system of problems: educational, cognitive, practical.

A cycle is a unit of the educational process.

The educational task determines the purpose of future activities in this cycle of educational activities. It can be solved only because of learning the content of the corresponding component.

Therefore, the educational problem has the following characteristics:

1) an intellectual disability that interferes with solving a cognitive or practical task and requires the search for new knowledge or new methods of action that allow overcoming these difficulties;

2) some model of a practical life problem;

3) the subject of the next activity can be identified from the situation of the educational problem;

4) the method of solving an educational problem is a generalized method of activity for solving a whole class of practical problems.

The main didactic goals, which are achieved when proposing an educational problem, include:

1) creating a positive attitude of schoolchildren towards the subject of the next activity;

2) stimulation of students' intellectual activity.

Cognitive tasks are aimed at introducing individual structural elements of the block (statements about the essential features of the component).

Practical tasks serve to form a holistic idea among schoolchildren about the studied components, to include it in the general system of knowledge, to form the ability to apply what has been learned in new standard and non-standard situations.

The cycle of the educational process can consist of one or more lessons of different types. However, it always includes the presentation of an educational task.

This is facilitated by so-called problematic situations: uncertainties, surprises, conflicts, refutations, assumptions, inconsistencies. As you can see, such situations are focused primarily on motives of activity related to cognitive interests.

During the traditional organization of the educational process, the management of the processes of perception, understanding, and memorization of educational information is based on the teacher's observations of the students' reactions to the presentation of the educational material, the analysis of the results of their oral and written surveys, their performance of various independent, control works of different durations. Based on these observations and analysis of students' answers and reports, the teacher decides on the further organization of the educational process.

At the same time, it remained unknown at which stages of the educational process, exactly which of the students have difficulties in perceiving and assimilating the relevant content of the program material. Therefore, one of the ways to intensify the educational process in the conditions of collective learning is to optimize the management of students' educational activities.

Optimizing the management of students' educational activities involves the creation of such conditions that will ensure the identification and timely overcoming of difficulties that arise for each of the students during the study of the program material.

For the first time, teachers' attention was drawn to the relevance of this problem in connection with the introduction of programmed learning into the practice of schools. But programmed learning did not receive further development over time for many reasons. The return to this problem relates to the search for ways to use new information technologies of learning, which are understood as such technologies that use means of informatization of learning (first of all – a computer) in the educational process, and are used as a means of managing educational activities[4].

To solve this problem, agreement on the selection of a unit of educational material and a unit of the educational process, and the classification of feedback are of fundamental importance.

[4] Ibidem.

If the components of the content of the school physics course (physical quantities, phenomena, laws, etc.) are chosen as a unit of educational content, each of them should be presented in the form of systems of statements about its essential features (structural elements), separate educational and didactic material, determine methods of activity that related to the introduction, substantiation, and application of structural elements and their systems[5], structural elements and their systems should be taken as "elementary" portions of the material; their justification; methods of activity associated with them. It is these "elementary" portions of educational content that are the subject of knowledge and assimilation by students. Actions related to managing the educational activities of schoolchildren are aimed at their formation in the minds of those who study.

There is a well-known typology of organizational forms of the management method (direct – indirect, dialogic – non-dialogical, rigid – not rigidly deterministic, etc.), which largely determine the essential characteristics of the learning technology implemented by the educational system. At the same time, in the conditions of collective learning, it is important to determine the features of open and cyclical management of students' educational activities. Open management occurs without the formation of feedback systems, that is, the activities of the teacher and students are carried out according to the program that determines the course of the educational process, without considering the results of the schoolchildren's assimilation of the corresponding "elementary" portions of the material. But even in this case, the teacher should use various methodical techniques to prevent the difficulties that may arise in students during the perception and assimilation of the relevant educational material. Such techniques include: consideration of structural elements from different points of view; the use of systems of rhetorical questions and the teacher's answers to them, which involve the application of structural elements to specific situations; drawing up working notes, etc.

Cyclic management involves the formation of feedback systems and can exist in two forms: implemented according to the «black box» principle, when feedback, and therefore process management, takes place taking into account only the output of the final product of the process (the path that leads to of this product remains unknown); is carried out according to the «white (transparent) box» principle – feedback carries information about the process of obtaining the final product[6].

Feedback includes: receiving information about the state of the managed object by the subject of management; analysis of the received information and comparison with the standard; development of management actions; execution of management actions.

In training, we deal with a complex, multi-element controlled object. Therefore, it is necessary to divide feedback into two types: external and internal.

To reveal the peculiarities of internal and external feedback, it is advisable to refer to the work of students with programmed texts.

The specifics of internal feedback can be clarified by looking at the student's work with a linearly programmed text. After each portion of the material there is a control question. After studying each portion of the material, the student answers this question and compares his answer with the reference one. After comparing the answer with the reference, the student decides: either to analyze a portion of the material again, or to move on to studying a new portion. Therefore, the essence of this feedback lies in the student's self-control. The information that goes through the feedback chain does not go beyond the system «the student is his own regulator». Feedback serves to regulate and correct the student's activity in the process of moving towards the defined goal.

Thus, internal feedback occurs between the controlled object and the controller belonging to it. The controlled object can be both an individual student and their group (work group).

The peculiarities of internal feedback are as follows: self-control of students is based on them; the information that goes through the feedback chain does not go beyond the «object – its own regulator» system; this system is not strictly connected with individual stages of collective activity in the educational process.

[5] Ibidem.
[6] Ibidem.

If the unit of the educational process is taken as its cycle, which forms a system of lessons, during which knowledge and assimilation of the content component of the school physics course and the formation of relevant action systems[7] take place, then the formation of internal feedback can occur at any time, within this cycle, which unites the educational activities of students both in class and outside it. This determines the time of using personal computers for the purpose of managing the processes of formation of relevant knowledge and skills.

Features of internal feedback indicate that when working on «elementary» portions of educational material, it is not necessary for the teacher to receive information about the results of each student's activity on fragments of educational information.

External feedback occurs between all managed objects (students of the class) and the proper all regulator (teacher). The information received by the teacher informs him about the results of students' assimilation of the systems of «elementary» portions of the educational material. Without this information, the teacher cannot plan the further course of the educational process. This indicates the need to use various means of frontal control.

The main task of educating schoolchildren is to form independent thinking in them, to prepare them for creative activity. It is necessary to prepare students for continuous education and self-education, to develop the skills to independently supplement their knowledge, to navigate the flow of scientific and socio-political information skillfully and quickly. Therefore, it is necessary to form rational methods and methods of educational work among schoolchildren, to cultivate in them the need for knowledge, interest in learning.

Today, in a physics lesson, it is necessary to give enough information with a minimum number of teaching hours, with a guarantee of the integrity of learning the educational material. Professionalization of school education requires the active introduction of new forms and methods of education. For this purpose, the use of elements of distance learning is considered effective.

Students' independent work with electronic educational materials must be systematically and systematically included in the educational process. Only under this condition will solidly subject competencies be developed.

In our opinion, it is more appropriate to include the following among the types of independent activities that students are offered to perform at home using the means of information and telecommunication technologies:

- work with text;
- training exercises;
- performance of long-term tasks;
- preparation of reports and abstracts;
- laboratory experiments and observations;
- technical modeling and design;
- studying (designing) models of physical devices.

During the study of new material in the lesson, the parts of educational information related to those generalized features of the components that were determined at the previous stage of the activity are separately analyzed, separating the essential features and their justification, illustrations, proofs, etc.

After studying the new material, the essential features of the component are systematized, forming a system of statements, the assimilation of which creates a holistic image of the subject of knowledge in the minds of students.

The study of individual parts of the content of the component involves not only the collective analysis of experiments, graphs, schemes, but also the independent work of students with various sources of textual information in the lesson. Most methodical works are dedicated to these independent works.

As you can see, the specified features of the organization of the educational process are aimed at forming students' skills in working with the text.

[7] Ibidem.

But this is not enough. Homework should be formulated in such a way that the student is forced to adhere to the general plan of activities with physical or technical texts[8].

This is facilitated by drawing up working notes.

There are two parts in the working synopsis – left and right. In the left part, with the help of pictures, keywords, the justification of individual essential features of the component is indicated. In the right part, the content of the corresponding essential feature is also indicated with the help of keywords[9].

At home, the student should, guided by the working notes, using the text of the textbook, electronic editions, publications on the Internet, find relevant essential features, their justification and additional examples.

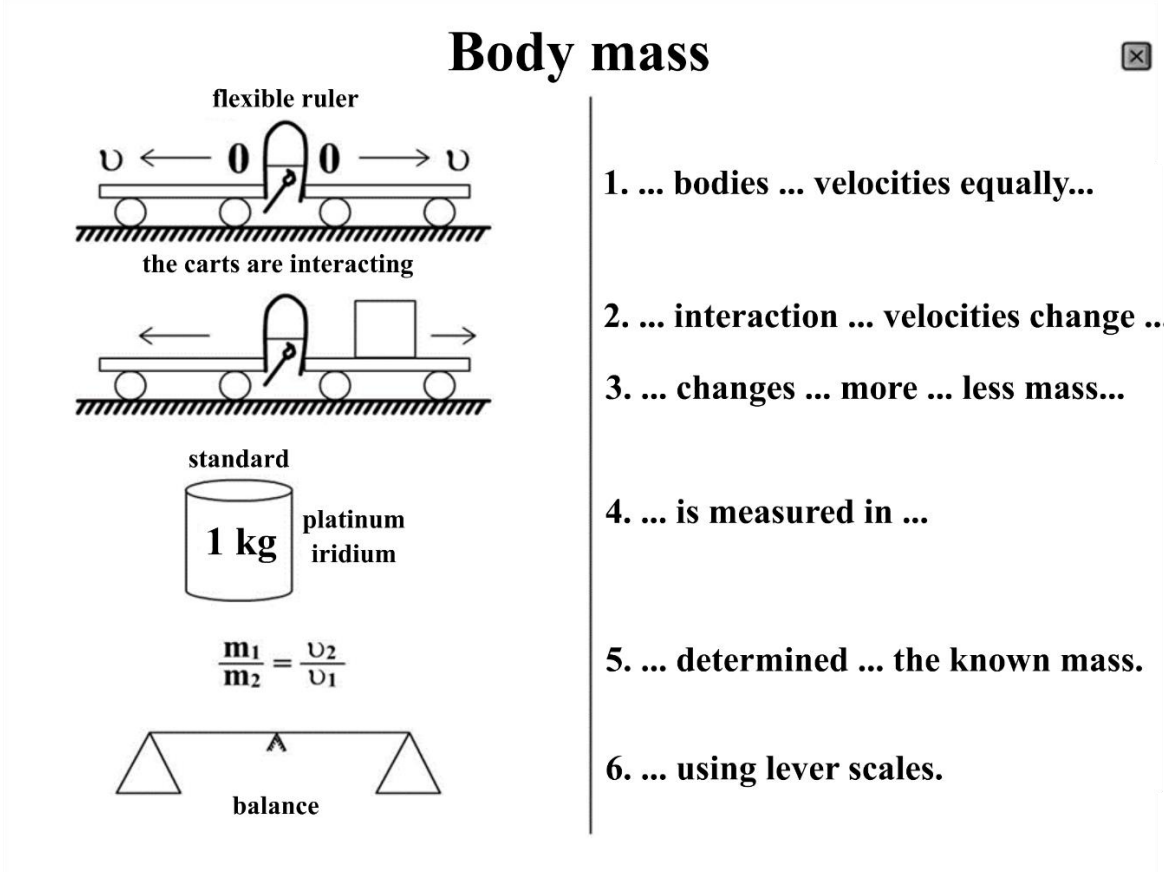

Fig. 1. Interface of the interactive synopsis

Considering the specified method of constructing the synopsis and the possibilities of information and multimedia technologies, the interactive synopsis has the following structure:

The synopsis interface has a name, control buttons and is divided vertically into two parts. The left contains the following elements: schematic images of experiments, drawings, photographs, graphs, letter designations, key (reference) words that express the main conclusions from experiments, or viewing phenomena. On the right, essential features of the studied component are recorded in abbreviated form (also with the help of keywords).

Each element of the summary is «active», that is, it represents a hyperlink or a button to go to a detailed view. Thus, when clicking with the mouse on a schematic image of an experiment (phenomenon) or a picture, the user goes to an interactive animation or watching a video clip

[8] Каленик М. В., Каленик В. І. Формування умінь роботи з навчальними текстами й структура процесу навчання фізики в основній школі // Вісник ЧДПУ ім. Т. Г. Шевченка. Випуск 9. Серія: педагогічні науки: збірник. – Чернігів: ЧДПУ, 2000. – № 3. – С. 66-68.

[9] Каленик М. В. Конспекти з фізики – один із засобів інтенсифікації процесу навчання в основній школі // Вісник ЧДПУ ім. Т. Г. Шевченка. Випуск 9. Серія: педагогічні науки: збірник. – Чернігів: ЧДПУ, 2000. – № 3. – С. 69-72.

of this experiment (phenomenon). When hovering the mouse over key words of an essential feature, they turn into a complete sentence.

Each portion of material can be entered in any sequence chosen by the user. Animations and videos can be repeated as much as needed.

The interactivity of animations means the ability of the user to influence the conditions of the course of phenomena or the parameters of the experiment, as well as the possibility of constructing some settings.

If the synopsis has the property of «absorption» or «intersection», that is, the structural elements contained in it are related to the structural elements or their systems of other components, then with the help of hyperlinks you can easily go to their view.

Such interactive notes can be placed on the Internet, thereby enabling students to work independently with the educational material, both in the case of their absence for certain reasons in class, and to repeat what they have previously learned. The teacher can use these notes (their elements) during any stage of the lesson, organizing various forms and methods of educational activity.

Relatively little time, given the profile orientation of learning, which can be used for solving physical problems, requires finding ways to increase their number without significantly overloading students with homework.

One of these methods is the use of long-term multilevel tasks for solving physical problems.

Its essence is as follows.

The study of a unit of educational material begins with the presentation of an educational problem, which in many cases is formulated in the form of a typical problem, which can be solved only after introducing the system of essential features of the component. After the sequential introduction of the system of essential features and their systematization, students are shown a sample of solving a typical problem and exercises are performed with the aim of consolidating new material, including it in the general system of knowledge from this educational subject, concretizing the conclusions obtained, and forming the skills of their application in various situations. This work continues while the students complete their homework.

Homework includes tasks of varying complexity, considering the profile orientation of the classes. The teacher reports the grading scale according to the ability to solve specific problems.

The results of such tasks are checked not at the next lesson, but after the completion of a certain topic by conducting various forms of control.

Long-term level tasks give students a relatively long time to complete them. Students will be able to use the Internet, remote help of the teacher via e-mail, Skype, social networks. This is not the main thing. It is important that students learn ways to solve problems of a certain type.

An opportunity opens for self-improvement of students' skills, their desire to obtain higher achievements in their educational work.

The long-term nature of the tasks allows you to increase the number of tasks for homework, contributes to the individualization of learning.

To focus students' attention on the logic of solving typical problems, to form in them the ability to apply learned concepts to specific situations, it is advisable to use computers.

While preparing for a practical lesson, solving typical problems on this topic, the student simultaneously uses the instructions on the monitor screen.

The text of the task, instructions with two answers to each of them, and comments on the execution of the instructions appear sequentially on the monitor screen.

The instructions reflect the algorithmic prescription. At the same time, they have certain features.

Algorithmic instruction for students should be concise, contain a relatively small number of actions. But each action should be as simple as possible, that is, such that it can be performed by almost all students.

Students receive an instruction on the monitor screen that can combine several actions performed one after the other.

The response to the instruction will reflect only the result of the corresponding action system. One answer is correct, the other has an error. Such an error can be the opposite sign in front of a physical quantity, the opposite trigonometric function, etc. Therefore, the error is small, but it forces the student to compare the answers, because the error is not obvious.

Why are two answers enough and not more?

With two answers, the student can, without understanding, point to the correct one.

The fact is that the student must perform all the actions prescribed by the instruction, understand them, and be ready to justify these actions. In addition, regardless of the chosen answer, the student is forced to refer to the comments regarding the appropriate actions. At the same time, the goal of solving the problem independently, considering the instructions displayed on the monitor screen, is the formation of skills to achieve the conscious implementation of action systems determined by the algorithmic prescription.

After choosing an answer, a text appears on the monitor screen, which comments on the actions that the student had to perform. This text often displays advice that leads to correct actions.

The procedure for working with the instructions is as follows: the student reads the instruction, performs the appropriate actions – performs part of the problem solving; then compares the obtained result with the answers and with the help of the mouse indicates the one of them that he considers to be correct.

After that, various options for further actions are possible.

1. The wrong answer is given. A text-comment on the actions provided by the instruction appears on the screen. After pressing the indicated button, the correct and incorrect answers appear on the screen. The student points to another answer with the mouse.

2. The correct answer is indicated. The same text as in the previous case appears on the screen. After pressing the indicated button, only the correct answer appears on the screen.

After performing any of the specified action options, a new instruction and answers to it appear on the screen. These actions are repeated.

The last instruction involves solving the resulting system of equations. There are also two answers to it. When choosing the wrong one, both answers remain on the screen. When choosing the correct answer, only it remains on the screen.

Solving the problem is complete. The student can receive on the screen either a system of instructions and correct answers to them, or the entire system of instructions, correct answers and comments on them.

The educational activity of students relates to the sequential solution of systems of problems that have different main didactic goals. With such an organization of the educational process, tasks are used to: motivate students' educational activities before studying a unit of content of the school physics course, in particular, to create problem situations (educational tasks or educational problems); as a basis for introducing essential features of what is being studied (cognitive tasks) and for consolidating the studied material, including it in the general system of knowledge, forming the ability to apply theoretical material to practical situations (practical tasks). Therefore, at the current stage of the development of physics teaching methods, the use of problems should not be limited to their purpose only for consolidating what has been learned and training practical skills, which was observed not in the not-so-distant past, orienting the educational process to the organization of exploratory educational activities of students.

An important stage of solving a physical problem is the analysis and understanding of the proposed situation, the result of which is the clarification and awareness of its physical content – the definition of physical objects, their states and processes taking place, the purpose of its solution. The nature of mental activity at this stage of solving the problem depends on the form of presenting the condition of the problem.

Acquaintance with the condition of physics problems involves the formation of an image of the situation presented in the student's mind. One of the signs of understanding and awareness

of this situation is the formation of its image in the mind. Illustrations for textual or graphic problems contribute to the creation of such images, the presence of which allows you to understand the physical essence of the problem, what is known, what needs to be found out, and determine the direction of the search for the unknown. Even in those cases in which the name of the process and certain numerical values of quantities directly determine which formula should be used to find the unknown, the awareness of solving a physical problem is accompanied by reliance on the image of this process. Insufficient attention to the formation in students of the ability to reveal the physical content of tasks, which is connected with the creation of the specified image, is one of the reasons for the enormous difficulties that arise for schoolchildren in those cases when the connection between the tasks is not immediately obvious from the conditions of the task values of physical quantities and the formula in which they should be substituted[10].

On the screen, next to the text of the task, it is desirable to depict the situation of the task. After the discussion and analysis of the conditions of the problem, the animation of the process (phenomenon) is demonstrated, each component of the process is demonstrated gradually[11].

Before the demonstration of the task situation, a task appears on the screen (which is saved during the following demonstrations): Describe the processes that will take place... or define the parameters of some state.

As a result of the analysis, one of the formulations of the problem conditions is arrived at – in the form of a text or a graph. This result can be obtained in the process of collective, group, individual work. The choice of one of the options for formulating the condition of the problem based on the analysis of the demonstrations depends on the goals of organizing the educational activity of the students in the general plan of studying the unit of educational content of the school physics course.

This form of presentation of the problem condition has several features.

1. Physical imagery of the task condition – an image of the situation is presented, reflecting a possible real process. This image can become the basis for the emergence in the mind of images of similar situations when working with the condition of a text or graphic task.

2. The integrity of the perception of the demonstrated situation, followed by the selection of its individual components, which corresponds to the logic of the cognitive process.

3. Image dynamism – the static scheme of the experimental setup is transformed into a dynamic model. This feature of the presented situation indicates that in multimedia tasks the subject of analysis is physical phenomena or processes.

4. Direct view of information about the condition of the task. Direct information – information that directly conveys important properties of objects. Students directly observe: changes in a physical object – air in a cylinder (the image of this air is blue, the brightness of which decreases as its volume increases); changes in the readings of measuring devices that determine the nature of the processes that take place in the air; changes in the values of physical quantities relative to those indicated on the scales of measuring devices.

5. Image interactivity. Depending on the situation, the image of which is displayed on the screen, it is possible to predict: increase, decrease, move, save with subsequent reproduction of the image, demonstration of a physical object from different observation points, etc.

6. Orientation of the analysis of the situation, which is demonstrated on the formation of students' ability to identify the essential signs of what is observed as fully as possible, accompanied by the transition from the observed image to its verbal or graphic description.

The entire history of the development of physics teaching methods, from the beginning of its inception as a pedagogical science, shows that the formation and development of the educational physics experiment relates to the struggle with the dogmatism of the teaching of the school physics course and the increase of the educational and educational potential of this educational subject.

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[10] Каленик В. І., Каленик М. В. Питання загальної методики навчання фізики / Пробн. навч. посібник. – Суми: РВВ СДПУ ім. А. С. Макаренка, 2000, –125 с.

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The need for wide use of a demonstration experiment during physics lessons is due to the following:

- an organic connection between the theoretical and experimental components of the content of physics-science, and therefore the corresponding educational subject;

- using it as one of the active methods of learning, aimed at: motivating the educational activity of students, which is determined by their cognitive interests; increasing the efficiency of perception, comprehension, understanding of educational content; on the organization of educational activities of schoolchildren, characterized by the development of their cognitive abilities;

- its impact on the formation in students of such important personality traits for a modern person as a critical attitude to any information and the desire to clarify its objectivity, the ability to observe and understand the events taking place in the surrounding world, etc.

Currently, there is a situation where most school physical education rooms do not have the necessary demonstration and laboratory school physical equipment due to its wear and tear and the lack of technical service centers for its repair. The modern list of equipment for demonstration and laboratory physics experiments recommended by the Ministry of Education and Science of Ukraine is very expensive, schools do not have such financial capabilities, which makes it impossible to conduct many demonstrations that significantly affect the quality of students' knowledge of physics in secondary schools.

In our opinion, the point of view according to which laboratory works and experiments have an advantage over the demonstration experiment, a reduction, even the absence of which will not significantly affect the results of learning physics, is also erroneous. Such an opinion contradicts a huge number of scientific and methodical works, which reveal the role, place, and interdependence of all types of school physical experiments.

This is the reason for the need to solve the mentioned problem.

This problem can be partially solved by returning to the previously popular experience of creating and using simple home-made equipment for conducting a demonstration physical experiment.

A more effective way of solving this problem relates to the modern trend of the development of the domestic school – the introduction of multimedia technologies into the educational process, as well as considering the attention paid to the computerization of educational institutions.

The development of modern multimedia means makes it possible to implement educational technologies at a fundamentally new level, using progressive technical innovations for this purpose. Modern multimedia tools include simulation tools and those whose operation is based on technologies called virtual reality.

Virtual objects or processes include electronic models of both real and imaginary objects and processes.

Virtual reality is created by multimedia tools that provide audio, visual and other types of information, create the illusion of the user entering and being present in a stereoscopically represented space.

The presence of modeling tools and «virtual reality» technology indicates the possibility of transferring demonstrations of physical objects from the teacher's demonstration table to multimedia tools to an interactive multimedia board, a touch screen, a large computer monitor. This possibility can be partially realized by showing all students of the class fragments of available electronic educational aids, physics textbooks, in which physical phenomena and processes are reproduced in dynamics.

At the same time, the expediency and effectiveness of existing and created computer demonstrations depends on the methodology of their application, which should be considered by both their developers and users.

Thus, it is advisable to include issues related to its expansion through modern multimedia tools to the modern physics teaching methodology, to its traditional section «Methodology and technique of school physics experiment». Even if there are necessary demonstrations of physical devices, devices, models, it is advisable to additionally use multimedia tools. Computer-based demonstrations

can be stand-alone, for example, to show physical objects that cannot be demonstrated using traditional physical classroom equipment, and can be carried out in conjunction with traditional demonstrations. But it is not necessary to exaggerate the educational advantages of demonstrations of virtual objects. A future physics teacher should know about virtual physical objects, be able to use them in the educational process, but in classes on physics methods, especially the methods and techniques of school physical experiments, he should use real physical devices, devices, and materials. This is one of the most important components of quality professional training of future physics teachers and a condition for preventing unjustified replacement of traditional demonstrations with computer ones.

In educational and methodological literature on physics, the term «experiment» is used in two senses. This must be considered when clarifying the methodology of a demonstration physical experiment – real and virtual. Two interpretations of the term «experiment» will finally allow us to answer the question: is there a difference between frontal laboratory experiments and works? This answer will affect the methodology of their implementation during physics lessons.

In some cases, the experiment means only the process of reproduction of a physical phenomenon in artificially created conditions.

The word «demonstration» (from the Latin demonstratio – show) means a visual image of familiarizing the listeners with any phenomenon, subject.

Therefore, the demonstration of the experiment (with the specified interpretation of it) should be understood as the simultaneous presentation to all students of the class of the subject of their cognitive activity or its individual features with the help of such devices, devices and other means that ensure the visibility of what is being demonstrated.

In other cases, the terms «experiment» and «experiment» have the same meaning. Therefore, in the future, instead of the two names «demonstration experiment» and «demonstration experiment», we will use only the first one, considering them synonymous.

An experiment is an activity aimed at learning the properties and regularities of physical bodies and phenomena by influencing the objects of research with special tools and devices.

If the demonstration of the experiment involves observing what is happening to record the external features of the demonstrated object, in particular the readings of measuring devices (if they are included in the research installation), the demonstration experiment is not limited to the specified system of actions.

The structure and content of the activity related to the demonstration educational experiment follow from the general plan of conducting the scientific experiment, because «the school educational experiment is a reflection of the scientific method of studying physical phenomena, therefore it (although it is not identical to the scientific one) should have the main elements of physical experiment, as a result of which students will be able to get an idea of the scientific experimental method»[12].

During the planning of a scientific experiment, the purpose and tasks of the experiment are determined, the hypotheses necessary for testing are proposed, the research object and its parameters are selected; the method of the experiment is determined based on both the equipment and the system of operations performed during the work, the sequence of experiments in the experiment is determined, the methods of processing the measurement results and the ways of testing the hypotheses put forward on this basis are selected.

Determining the sequence of actions that make up an activity – an educational physical experiment – it is not necessary to personalize these actions, assuming that each of them can be performed by any subject of the educational process.

The specified system of actions will generally look like this:

1. Based on the logic of studying a specific fragment of the educational material, the purpose of the experiment is determined, its task or a hypothesis is put forward that needs to be tested.

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2. It is clarified in what way it is possible to solve the tasks formulated before this the principal scheme of the research installation is clarified.

3. The necessary devices and materials are selected.

4. The research facility is assembled.

5. The sequence of operations during experiments is determined.

6. The students' attention is drawn to what it is necessary to observe. An experiment is being carried out. The results of observations are recorded.

7. The obtained results are analyzed and relevant conclusions are formulated.

This activity plan defines a generalized experimental skill, which, according to the modern requirements of the school curriculum in physics, should become one of the results of studying this subject.

The activity is a demonstration experiment aimed at the students' conscious assimilation of educational material, the essence of which is work about knowledge.

The content of a unit of educational material can be in the form of a system of statements about its essential features. The introduction of each significant feature is related to solving a cognitive problem. One of the ways to solve such a task is a demonstration experiment. After clarifying the condition of the cognitive task, understanding its requirement or question, it is determined what needs to be determined and in what way, establishing its main features and conditions of implementation, the planned action plan is implemented, the obtained result is analyzed. This general activity plan is concretized by a certain system of actions.

If an essential feature is introduced using, for example, one of the verbal teaching methods, then its formulation in relation to the demonstration experiment can be considered as a hypothesis that needs to be confirmed. In this case, based on the formulation of the statement about the essential feature, it is determined how this object of knowledge can be reproduced, an experiment is planned and conducted, and the obtained results are compared with the «hypothesis».

Therefore, a physical demonstration experiment always reflects the general structural elements of volitional, conscious, purposeful activity – awareness of the purpose of the activity, drawing up its plan, executing this plan, working with the result.

Of course, in each specific case, individual actions of the specified plan can be combined and, on the contrary, expanded due to the introduction of new actions, for example, consideration of the installation, their structure, the principle of action, if they were not previously known to the students.

From the given system of actions, the plan for conducting a demonstration experiment includes actions related to the demonstration of experience in its understanding. Demonstration of experience can be a component (but not determining) of activities related to the application of other teaching methods and involve the following system of actions: demonstration of the research setup, indicating its structure, paying attention to what needs to be observed, conducting a demonstration, recording the result observation.

The specified activity plan is like the case of a virtual demonstration physical experiment. At the same time, during its implementation, the requirement that arises from the very concept of «virtual reality» becomes important – creating the illusion of students entering and being present in a stereoscopically presented space. The fulfillment of this requirement depends on the developers of the relevant computer programs, which require the use of special knowledge of psychology and physiology of object perception with the help of various senses. This requirement is met by the following features of images on the screens of multimedia devices: 1) virtual experiment equipment must reflect real demonstration devices, devices, models; 2) images and their changes should appear on the screen after preliminary discussion by the subjects of the educational process and the adoption of relevant decisions; 3) placement of the devices that make up the research installation, equally for real and computer demonstrations.

The second and third features of the images are not mandatory during the demonstration of virtual objects that accompany the educational activities of schoolchildren associated with the use of various teaching methods.

Electronic models of devices, devices, experiments create conditions for a more vivid account of the following features of a physical experiment: isolation of the investigated phenomenon from the influence of other insignificant phenomena; studying it in its «pure» form; the possibility of its reproduction under strictly fixed conditions; planned changes in the conditions of experience. In such an experiment, the tendency to implement fairly accurate measurements in a demonstration experiment becomes realized.

In the 1960s, proposals to transfer part of the experiments from the teacher's demonstration table to the students' workplaces became popular. These experiments were called «frontal experiment» or «laboratory experiments». Later, proposals appeared regarding the use in demonstration experiments of measurements of physical quantities that were inherent in laboratory work (frontal work, practical work). This tendency to improve the demonstration physical experiment was most fully manifested in the works of methodical physicists.

The virtual demonstration experiment has additional possibilities of increasing the visibility of what is being demonstrated, using the features of computer graphics.

The most effective multimedia tool for a virtual demonstration experiment is an interactive (touch) screen, the properties of which include: unlimited area; an extended set of tools for capturing information and graphically commenting on screen images; the possibility of saving fixed information in electronic form; possibility of saving information in a dynamic form (video file). The name «interactive» indicates the interaction of subjects of the educational process with this tool: subjects of the educational process influence the formation and changes of images on the screen; images on the screen, their changes affect the content of the teacher's and students' activities. On the interactive screen, you can demonstrate not only electronic models of physical objects, but also images obtained with the help of a video camera. The choice of one of the types of these images depends on the one that most vividly reflects the property of the subject of knowledge, and required from the content of activities aimed at perception, awareness of the relevant educational material. On the interactive screen, you can move individual parts of the images by touching them with your hand, imitating the physical impact on virtual objects.

One of the most promising areas of using information technologies in the study of physics is computer modeling of physical phenomena and processes. Computer models allow you to demonstrate many physical effects on the computer screen, and allow you to organize new, non-traditional types of educational activities of students.

Computer models allow the user to control the behavior of objects on the monitor screen, changing the initial conditions of experiments, and to conduct various physical experiments. Some models allow you to observe on the monitor screen, simultaneously with the progress of the experiment, the construction of graphic dependencies of several physical quantities. Such models are especially valuable because students, as a rule, experience significant difficulties in constructing and reading graphs.

The following types of tasks can be distinguished for students' independent work with computer models:

- computer experiments;
- experimental tasks (that is, tasks for the solution of which it is necessary to think through and set up an appropriate computer experiment);
- calculation tasks with subsequent computer verification (tasks that must first be solved without using a computer, and then check the answer obtained by setting up a computer experiment). When compiling such tasks, it is necessary to consider both the functionality of the model and the ranges of change of numerical parameters;
- tasks with missing data (when solving such tasks, the student must figure out which parameter is missing to solve the task and independently choose its value);
- creative tasks (the student is asked to compose one or more tasks, solve them independently, and then, using a computer model, check the correctness of the obtained results);
- research tasks (students need to plan and conduct several computer experiments that would allow to confirm or refute certain regularities);

• problematic tasks (with the help of several models, it is possible to demonstrate so-called problematic situations, that is, situations that lead students to an imaginary or real contradiction, and then offer them to understand the reasons for such situations using a computer model).

So, if we are talking about remote learning of physics for schoolchildren, then first, it is necessary to eliminate the distinction between the current level of physics teaching at school and the didactic capabilities of modern technologies of the information society. In our opinion, it is expedient to use distance learning opportunities not separately (distributed), but integrated.

The modern development of society is characterized by a transition to a new stage, in which new information and communication technologies play an important role. Computer literacy is a necessary attribute of a modern person, which contributes to organic socialization in today's rapidly changing environment. Therefore, modern tasks require new solutions in creating and updating the organization of education, including the latest technical and technological means to increase efficiency and optimize the educational process.

Cloud technologies are one of the promising areas of development of modern information technologies. Cloud technologies (English Cloud computing) are technologies of distributed data processing, in which computer resources and capacities are provided to the user as an Internet service.

Currently, there is little experience of using cloud technologies in the educational process of educational institutions of various levels. In several educational institutions, cloud technologies are used only for storing and editing documents, while little attention is paid to their pedagogical and didactic capabilities.

The most common system of services based on cloud computing technology used in the educational process is Google Apps, which are web applications based on cloud technologies. They provide the participants of the educational process with tools, the use of which is designed to increase the effectiveness of communication and joint work. However, today the methodical and technological aspects of the application of cloud technologies in the educational process are insufficiently developed.

Cloud technologies are a paradigm that involves remote data processing and storage. This technology provides Internet users with access to computer resources of the server and the use of software as an online service.

Cloud technologies allow consumers to use programs without installation and access personal files from any device with Internet access.

The main advantages of using cloud technologies are:

- informational security;
- no dependence on computer and software modifications
- security;
- performance of various types of educational work, control and evaluation in online mode;
- reducing the need for specialized premises;
- saving disk space;
- openness of the educational environment for all participants of the educational process;
- cloud technologies do not require acquisition and maintenance costs
- special software (access to applications can be obtained through a web browser window);
- Google Apps support all operating systems and client programs used by students and educational institutions;
- working with documents is possible using any mobile device that supports Internet access;
- all Google Apps tools are free.

Among the disadvantages: dependence on the quality of the communication channel, risks of technical failures, legal issues.

The introduction of cloud technologies allows solving several problems and provides an opportunity to create virtual management and educational structures that will provide not only unlimited access to electronic educational resources, but also create new technologies for the organization of educational activities and communication for those institutions that do not have the appropriate material and technical resources.

Google Apps services provide the following opportunities for their use in the educational process:

- exchange of information and documents;
- implementation of joint projects in groups;
- organization of network collection of information from many participants of the educational process;
- implementation of current, thematic, final control, as well as self-control;
- planning of the educational process.

The didactic capabilities of cloud technologies include:

- the possibility of organizing the joint work of a large team of teachers and students;
- an opportunity for both teachers and students to jointly use and publish documents of various types and purposes;
- quick inclusion of the created products in the educational process due to the lack of territorial attachment of the service user to the place of its provision;
- organization of interactive classes and collective teaching;
- performance of independent work by students, including collective projects, in the absence of restrictions on «size of the audience» and «time of classes»;
- interaction and joint work among peers (and not only), regardless of their location;
- creation of web-oriented laboratories in specific subject areas (mechanisms for adding new resources; interactive access to modeling tools, information resources; user support, etc.);
- organization of various forms of control.

The experience of using cloud technologies in education allows us to conclude that it is much more convenient for a teacher to have access to his information anywhere and anytime, than to be tied to a certain workplace, since it is possible to conduct online lessons, trainings, round tables, the possibility to adapt the material to each student.

The use of cloud technologies enables the teacher to interest students, motivate them to study, think independently, and teach them to choose the most important thing. Therefore, the teacher must be able to use the latest technologies as a means of activating the cognitive activity of students in physics in combination with teaching methods instead of retelling ready-made information.

It is a pity that children stop thinking independently, they are more and more eager to spend time on computer games, save time on writing off ready homework. Placing on the cloud individual and group homework compiled by the teacher forces the modern student to learn, to show perseverance and curiosity in studying the subject. All students have a login and password (registered) in the network environment. A link to access the material is sent to the entire class.

The LearningApps service is a Web 2.0 application for supporting educational processes in educational institutions of various types. This is a designer for developing interactive tasks in various subject disciplines for use in lessons and in extracurricular work. The main idea of interactive tasks is that students can check and consolidate their knowledge in a playful way, which helps to form the cognitive interest of students.

The service has a gallery of publicly available interactive tasks, which is updated daily with new materials created by teachers from different countries.

It is important to note that the correctness of tasks is checked instantly. In addition, the Learningapps.org resource provides an opportunity to organize virtual classes, manage student accounts, prepare tasks for students of each class, and track the progress of tasks.

In the educational process, cloud technologies are used as a means of learning, because with the successful methodical use of these technologies, in the presence of digital devices and the Internet, there will be an increase in the quality of studying the educational subject. With the help of cloud technologies, it is possible to work remotely (distance learning).

The effective use of cloud technologies in the study of physics at school interests' students, motivates them to study, independent thinking, teaches them to choose the main thing, etc. Therefore, the teacher must be able to use the latest technologies as means of activating the cognitive activity

of students in physics in combination with teaching methods instead of retelling abstract, «ready-made» information.

Since this type of activity does not limit learning only within the school, students can individually study the information they are interested in at home.

Watch videos, search for new sources of information, discuss certain novelties, etc. This type of activity, when students can learn independently, both at school and at home, in an interactive way and according to their own trajectory, will additionally interest them in studying physics. In addition to the information provided there, you can add certain test tasks, surveys, etc.

Each created online exercise on the cloud provides an opportunity to control students' knowledge both in class and for self-control, to prepare for tests at a convenient time. A site created by the teacher, which contains interactive exercises of various types of control, multimedia interactive animations of physical phenomena and experiments, brief summaries of the structural elements of the components of the content of the school physics course, interesting and useful information on physics, materials for preparing for DPA and external examinations, can play a significant role in this.

With the help of the Google application – Realtime Board, you can work with students collectively or individually online, using any software, the main thing is to have access to the Internet.

Using the online board together with students, you can study 3D models of various devices, if they are not available at school, consider and explain the principle of action of any element, demonstrate animations of physical phenomena and processes.

In Online board, all the functions performed by the blackboard at school are available. With the help of this application, the teacher's dialogue with students includes the creation of drawings, records, tables and diagrams, which can be edited by joint actions and build a story about this or that phenomenon on them. Also, this service provides for introducing new concepts, explaining them online, solving physical problems, conducting experiments, and it will also be possible to make notes in notebooks. Each used board is stored with all the material posted on it, so at any moment the student can connect to it again and repeat the material he has passed on his own.

Records and graphic images on the online board in some cases accompany the course of reasoning of the participants of the educational process, in others – reflect the results of obtaining and processing certain information, in others – are illustrative material, in the fourth – reflect the subject of the next educational activity.

Therefore, cloud technologies are a modern toolkit in the educational process, which the teacher must be able to use to improve and optimize it, interest students in the subject, expand their horizons, increase motivation to study, activate mental activity, promote generalization of information and better assimilation.

Thus, the main didactic advantage of using cloud technologies in the educational process is the organization of both joint work of the teacher and students, as well as independent work, which opens up new perspectives that will contribute to increasing the efficiency of the educational process and, therefore, better achievement of the goal, since these technologies are high-tech, relevant and promising. Cloud technologies offer an alternative to traditional forms of organization of the educational process, creating opportunities for individual learning, interactive classes and collective learning. The introduction of cloud technologies will not only reduce the costs of purchasing the necessary software, increase the quality and efficiency of the educational process, and prepare the student for life in the modern information society.

To organize distance learning, you can use platforms for online interaction, most of which are free, including:

Google Classroom – the service provides an opportunity to control learning results through testing, systematize, evaluate activities, view the results of tasks, comment and organize effective communication in real time. The main element of Google Classroom is groups.

Moodle – is a service that allows you to submit educational material in various formats (text, presentation, video material, web page; classes as a set of web pages with possible intermediate performance of test tasks), conduct testing and surveys, tools for monitoring learning results.

Classtime – is a platform for creating interactive educational applications that allows you to analyze the educational process and implement strategies for an individual approach. There is a library of resources, as well as the ability to create questions.

Padlet is a virtual whiteboard on which you can place individual tiles-posts with text information, hyperlinks, images, attach files, audio, video recordings.

Edmodo is an educational technology platform that offers communication, collaboration and coaching opportunities for secondary schools, colleges and teachers. The Edmodo network enables teachers to share content, create tests, quizzes and surveys, and manage communication with students, colleagues and parents. Students and their parents can join Edmodo only after being invited by a teacher.

Google Meet – video meetings are integrated with other Google online tools.

Skype – video and audio calls with the function of conversations, chats and the possibility of interaction.

Zoom is a service for conducting video conferences and online meetings. You can connect to a video conference using a link or a conference ID.

Loom is a platform for video and audio conferencing, interaction, chat support and webinars.

Google Forms is survey administration software that is part of Google Software. It allows you to collect information from users through surveys. Collected information can be automatically entered into a spreadsheet.

«На урок» platform – interactive tasks to control knowledge and involve students in active work in the classroom and at home.

«Всеосвіта» – platform allows users to create their own tests at any convenient time, which can be used to consolidate, test students' knowledge, and conduct independent and control work.

The teacher needs to establish communication between all participants of the educational process. For this, there is a huge number of necessary tools: the ability to send instant messages, participate in discussions on forums, create ads, post news.

Google Class is a free service for educational institutions. It helps to save time, organize work more efficiently and communicate with students. Google Classroom connects Google Drive and Gmail.

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Edmodo is an educational technology platform that offers communication, collaboration and coaching opportunities for secondary schools, colleges and teachers. The Edmodo network enables teachers to share content, create tests, quizzes and surveys, and manage communication with students, colleagues and parents. The system is teacher-oriented: students and their parents can join Edmodo only after being invited by a teacher.

The free version of Microsoft Teams combines all resources into a shared workspace, which allows you to work from anywhere, communicate and exchange information.

Moodle is an educational platform designed to unite teachers, administrators and students in one reliable, secure and integrated system to create a personalized learning environment.

Modern online tools are intuitive to almost every user, so you can learn to use them easily and quickly. It is necessary not only to revise lesson notes, textbooks, manuals from paper to electronic version, but to develop methods and forms of such integrated education and train teachers from the very first steps of obtaining the appropriate higher education.

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ANNOTATION

Part 1. INFORMATION AND INNOVATIVE TECHNOLOGIES IN EDUCATION

1.1. Mykhailo Kalenyk. ORGANIZATION OF ONLINE EDUCATION IN PHYSICS AT SCHOOL USING MODERN INFORMATION TECHNOLOGIES

The method of using modern information technologies for the organization of online classes in physics at school is proposed. It is based on an integrative model of the educational process. Multimedia technologies are considered when working with educational texts, conducting a physical experiment, solving problems, managing the educational activities of students, repeating the studied material, checking, recording knowledge, organizing independent activities of students. Ways of organizing distance learning in synchronous mode using video conferences, interactive animations of processes and phenomena, training exercises, web 2.0 technology, and cloud services are offered.

1.2. Lidiia Slipchyshyn. THEORETICAL AND METHODOLOGICAL BASIS OF SPECIALISTS VISUAL CULTURE FORMATION

The article substantiates the theoretical foundations of the specialists' visual culture formation. The philosophical basis of the concept of "visual" is analyzed. The importance of discourse experience forming is shown, which helps the individual to perceive and explain the "inexpressible", to fill the image with meaning, and produce ideas. It has been established that the visual-figurative way of conceptualizing reality opens up wide opportunities for identifying connections and working with information, building new concepts and images. The role of visual thinking in organizing mental activity and working with information is emphasized. The essence of a specialist's visual culture is revealed and its features for artistic and technical profiles are shown.

1.3. Natalia Afanasieva. FEATURES OF THE RELATIONSHIP OF EMPATHY AND BEHAVIORAL STRATEGIES IN CONFLICT AMONG PSYCHOLOGY STUDENTS

The article presents an analysis of the relationship between empathic abilities, tendencies and styles of conflict behavior in the studied psychology students, which revealed the presence of a direct and inverse relationship between these indicators. The general trend shows that the higher the level of empathy among the subjects, the less aggressive forms of behavior they choose in the conflict. It should be noted that among the strategies of behavior in the conflict, compromise and cooperation prevail. This is probably due to two main factors – the gender of the subjects (girls predominate in the group) and professional focus (psychology). But this assumption needs additional analysis. Based on the conducted psychodiagnostics research, a social-psychological training program aimed at optimizing the empathy of future psychologists was developed.

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