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Видавнича група

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Ми б'ємось за те, чому нема ціни в усьому світі — за Батьківщину.
О. Довженко

Наукові інновації та передові технології

СЕРІЯ "УПРАВЛІННЯ ТА АДМІНІСТРУВАННЯ"
СЕРІЯ "ПРАВО"
СЕРІЯ "ЕКОНОМІКА"
СЕРІЯ "ПСИХОЛОГІЯ"
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USE OF MULTIMEDIA EDUCATIONAL TOOLS ON THE EXAMPLE OF STUDYING THE TOPIC "COMPUTER NETWORKS"

Abstract. Today, the main problem is the small number of multimedia applications that can be used while studying at school. Given this, the issue of using multimedia learning tools in the pedagogical process becomes important; multimedia teaching aids help the teacher to formulate the problem, activate the students' perception of the educational material, to ensure solid assimilation of knowledge and formation of abilities and skills of independent work of schoolchildren; multimedia demonstrations, thanks to their information saturation and clarity, help the teacher to explain difficult-to-reach theoretical material and contribute to its better understanding.

Today, for a teacher who has received a certain philosophical, psychological, general didactic, logical, mathematical training and knowledge in the field of fundamental issues of informatics, it is necessary to show how it is possible to creatively approach the teaching of informatics to schoolchildren of different age groups and with different directions of education in educational institutions of humanitarian, natural sciences, physical and mathematical and other profiles. Contradictions between the requirements for training students in informatics and spontaneously formed approaches to studying informatics in specific educational institutions give rise to a number of psychological-pedagogical and methodical problems.

The article theoretically substantiates and describes the practical application of the developed multimedia tools to the study of the topic "Computer networks".

The essence of the use of multimedia technologies in the educational process is revealed, the main aspects of studying the topic are analyzed.

The materials and results of the research can be used for further research of the problem, when studying the course "Methodology of teaching computer science", by school teachers in practical activities.

Keywords: multimedia, computer networks, packet exchange, server, domain.

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ВИКОРИСТАННЯ МУЛЬТИМЕДІЙНИХ ЗАСОБІВ НАВЧАННЯ НА ПРИКЛАДІ ВИВЧЕННЯ ТЕМИ «КОМП'ЮТЕРНІ МЕРЕЖІ»

Анотація. На сьогодні основною проблемою є невелика кількість мультимедійних додатків, які можна використовувати під час навчання в школі. Важливого значення з огляду на це набуває питання використання у педагогічному процесі мультимедійних засобів навчання; мультимедійні засоби навчання допомагають учителеві сформулювати проблему, активізувати сприйняття учнями навчального матеріалу, забезпечити міцне засвоєння знань та формування умінь і навичок самостійної роботи школярів; мультимедійні демонстрації завдяки своїй інформаційній насиченості та наочності допомагають вчителеві пояснити важкодоступний теоретичний матеріал та сприяють кращому його розумінню.

Сьогодні для педагога, який одержав певну філософську, психологічну, загальнодидактичну, логічну, математичну підготовку і знання в галузі фундаментальних питань інформатики, необхідно показати, як можна творчо підходити до навчання інформатики школярів різних вікових груп і при різних спрямуваннях навчання в навчальних закладах гуманітарного, природничого, фізико-математичного та інших профілів. Протиріччя між вимогами до

підготовки учнів з інформатики та стихійно сформованими в конкретних навчальних закладах підходами до вивчення інформатики породжують цілий ряд психолого-педагогічних та методичних проблем.

В статті теоретично обгрунтовано та описано практичне застосування розроблених мультимедійних засобів до вивчення теми «Комп'ютерні мережі». Розкрито сутність використання мультимедійних технологій у навчальному процесі, проаналізовано основні аспекти вивчення теми.

Матеріали та результати дослідження можуть бути використані для подальших досліджень проблеми, при вивченні курсу «Методика навчання інформатики», вчителями школи у практичній діяльності.

Ключові слова: мультимедійні засоби, комп'ютерні мережі, обмін пакетами, сервер, домен.

Problem statement. Professional and methodical training of informatics teachers is an urgent problem today. Contradictions between the requirements for training students in informatics and spontaneously formed approaches to studying informatics in specific educational institutions give rise to a number of psychological-pedagogical and methodical problems. In our opinion, the most urgent problems regarding the study of informatics are: the ratio of fundamental and applied (technological) components in the informatics course; methodical system of teaching informatics at school; improving the content of computer science education; development of the material base of computer science education, provision of educational institutions with computer equipment; implementation of intersubject connections, the integrating role of the subject "informatics", the use of information technologies (including computer telecommunications) in teaching all subjects; development of computer-oriented methodical systems for teaching all academic subjects, including mathematics, physics, biology, geography, etc.

New approaches to building a system of methodical training of informatics teachers are determined by: the need to take into account a complex of trends in modern education: standardization, technologization, humanization, continuity, informatization, etc.; the need to transfer, when creating a system of methodical training of future teachers, from the conceptual level to the operational-processual level of ideas of the professional pedagogical orientation of the training of the future teacher and professionally oriented educational and cognitive activity of students; the need to reorient the educational process regarding the methodology of teaching informatics to the priority of the developing function relative to the educational one; the emergence of various types of general educational institutions, educational programs and computer science textbooks for them, which requires matching the methodical training of the future teacher with the variable space of school education in computer science, which is constantly developing.

The use of multimedia technologies in lessons contributes to better assimilation of educational material by students, increasing interest, individualization of learning,

development of creative abilities, reduction of types of work that tire the student, use of various audiovisual means (music, graphics, animation) to enrich and motivate learning, dynamic presentation of material, forming the student's self-esteem and creating conditions for independent work.

Analysis of the latest research and publications. The expediency of using multimedia learning tools, the recognition of its advantages and the peculiarities of implementation are the subject of research by many scientists. Multimedia teaching tools have an indisputable advantage over other tools when it is necessary to show phenomena and processes of development and dynamics that are not available for direct observation. It is advisable to use them to fix the student's attention on separate parts of the static material. Interactive learning technologies are used to create comfortable learning conditions in which everyone feels their success, their intellectual capacity [3].

Multimedia technologies are powerful tools for creating and presenting multi-level scientific thought. The advantages of using multimedia technologies are obvious, as they increase the interest and ensure the activity of the listeners during the presentation of the material, which is impossible in the situation of the classical format, when the teacher does not have multimedia technologies [6].

The content of the multimedia material must meet the requirements of the educational programs. The problem of a small amount of Ukrainian-language multimedia material is temporary. The issue of creating support in the language of instruction is positively resolved by the teacher in the process of preparing for the training session.

Game programs provide a dynamic presentation of the material. As the experience of a secondary school shows, its leading specialist in the field of ICT is a computer science teacher [4]. He should be able to balance the advantages and disadvantages of using network technologies in the educational process [5].

The term "multimedia" allows the use of various means of presenting information when solving problems. This refers to three-dimensional computer graphics, audio and video sequences. The latest achievement in multimedia development is artificial (virtual) reality interfaces, which allow to achieve extreme visibility in simulation and educational programs [1].

The modern system of methodical training of informatics teachers is at the stage of formation in the period of transformations taking place in the education system of Ukraine, the new objectives of which primarily provide for the development of the human personality. These orientations are manifested in different directions: in the development of the system of continuous education, in the emergence of alternative education forms, in the development of new approaches in the formation of the content of education, in the wide use of new pedagogical interactive technologies. Under such conditions, the questions of methodical training of informatics teachers are particularly acute.

All this requires a revision of the goals, structure and content of the course "Methodology of Informatics Education", which sometimes has a prescriptive nature. Under the conditions of the modern paradigm of education, it is no longer enough to know the methods of solving specific tasks in informatics, although this knowledge remains an important factor in the professional and methodical training of a teacher.

Today, for a teacher who has received a certain philosophical, psychological, general didactic, logical, mathematical training and knowledge in the field of fundamental issues of informatics, it is necessary to show how it is possible to creatively approach the teaching of informatics to schoolchildren of different age groups and with different directions of education in educational institutions of the humanities, natural sciences , physical and mathematical and other profiles.

These arguments determined the choice of the research topic.

The purpose of the study. Theoretically substantiate and practically develop multimedia tools for studying the topic "Computer networks".

Presentation of the main research material. Not all institutions of higher education have recommendations for teachers on the development of presentations. That is, all teachers act on their own taste and discretion when creating presentations. Of course, they can follow guidelines on the internet, which usually boil down to simple design, which recommend obvious things, such as font size, text on a slide should be large enough to be seen, or presentation information should be reliable, should not contain errors, and the content should correspond to the set goals and objectives, etc. In order for the presentation to be not only nominal, but also to attract the attention of listeners and be easy to learn, you can use the cognitive theory of multimedia learning by Richard Meyer [8].

The cognitive theory of multimedia learning is based on the theory of multimedia learning, which in turn refers to the dual coding theory of Allan Paivio [7]. According to this theory, optimal perception of multimedia material occurs only when verbal and visual material are presented simultaneously. In addition, this theory includes several principles for optimizing materials of multimedia technologies, including presentations.

Methodical work when using presentations and video films in the lesson involves the following stages:

a) choosing a lesson topic using a film (presentation);

b) preview and analysis of the film (presentation);

c) choosing the method of conducting the lesson (determining the purpose, place, methods, techniques, time);

d) drawing up a lesson plan.

Let's consider each of the listed stages.

Choosing a lesson topic. Demonstration of the film (presentation) is not an end in itself, it is necessary for better methodical organization of the lesson and deepening of its content. Taking into account the pedagogical features of educational

cinema, it is advisable to use multimedia when it is necessary for: familiarization with the history of science, the material and spiritual life of society; showing processes in motion and development; disclosure of phenomena that are not available for direct observation; expanding the boundaries of the demonstration experiment; showing the practical application of theoretical laws.

Preview and analyze multimedia learning tools. The teacher, having familiarized himself with the content of the video film (presentation), must analyze it, determining whether the content of the video film (presentation) corresponds to the chosen topic, which fragment from the film (presentation) and for what purpose should be shown. It is also necessary to determine the type and structure of the lesson, the location of technical teaching aids, methods and techniques of video film demonstration (presentation), methods of activating the cognitive activity of students, and the time of the demonstration.

The choice of the method of conducting the lesson. The feasibility of using films in the educational process is determined by many factors: the pedagogical and scientific quality of the film itself, the age of the students, the content of the material being studied, and the methodological maturity of the teacher.

Depending on the mentioned factors, the film can be used as: an introduction to a new topic; as instructional - before carrying out practical work; as illustrative - to illustrate the material presented by the teacher; as heuristic — one that carries new information; as a final one — at the end of studying the topic.

In order to realize the defined goal of the lesson in its structure, the film can be given a different place. The film can be used at separate stages of the lesson: when explaining new educational material to independently communicate new information or to illustrate the material communicated by the teacher; during consolidation and generalization; in order to control knowledge.

The pedagogical effectiveness of a lesson using a film will depend on how skillfully the teacher can choose an adequate form of using a video film or presentation for the lesson. Correctly selected methodical method of demonstration contributes to increasing the effectiveness of the educational process.

The methodical preparation of the teacher for the lesson using the film ends with the drawing up of the lesson plan — the lesson synopsis.

Let's consider the topic: The concept of a global and local computer network. Network hardware and software. Concept of server and client computer. Two presentations were created for the topic: "Various types of computer networks", "Methods of connecting a computer to a network". First, we will use "Various types of computer networks" when studying new material.

When viewing the presentation, it is worth explaining to the students in more detail that the development of modern local networks has led to an increase in the distance of information transmission by several tens of kilometers, and this is no longer the distance between computers on neighboring desktops. Therefore, today a local network is considered to be such a network in which users do not notice the

presence of the connection between computers, that is, the local network must provide transparent communication.

Unlike local networks, WANs do not limit the number of subscribers, so they can connect computers located around the world.

The topology of the network determines the requirements for equipment, type of cable, the possible and most convenient methods of exchange management, reliability of operation and the possibility of expanding the network. When viewing slides with network topologies, it is worth noting the main advantages and disadvantages of each of them.

The advantages of a fully connected topology (Fig. 1): the failure of one computer does not necessarily lead to the failure of the entire network; guaranteed bandwidth of the communication channel; such networks are easy enough to diagnose. Disadvantages of a fully connected topology: the difficulty of rebuilding or adding another computer; high cost

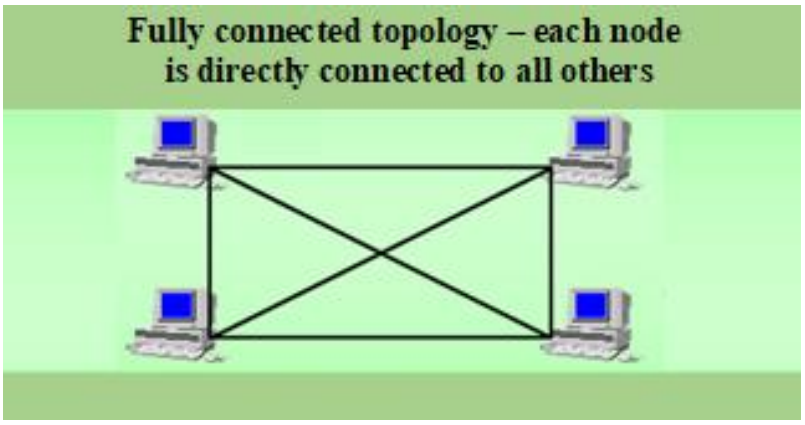

Fig. 1 Fully connected topology

Since the tree topology is a combination of bus and star topologies, it is characterized by their respective advantages and disadvantages (Fig. 2).

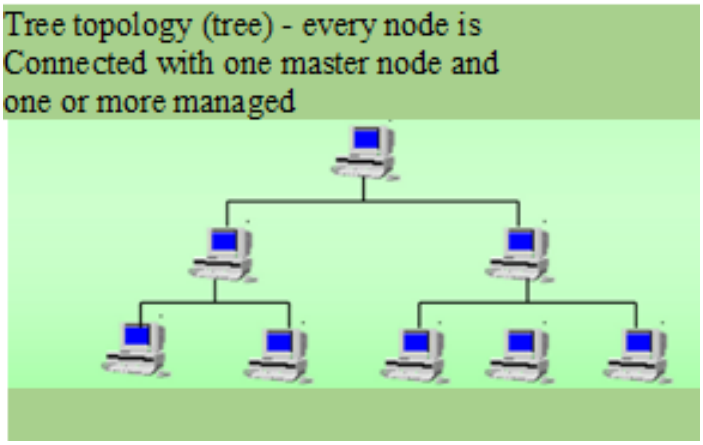

Fig. 2 Tree topology

When viewing the "Message switching" slide from the "Various types of computer networks by communication method" category, it should be noted that such switching does not occur in its "pure" form.

Also, for this lesson, using Adobe Flash, we have developed animated clips "Data transfer from computer to computer" (Fig. 3) and "Packet exchange in a communication session" (Fig. 3).

Fig. 3 Data transfer from computer to computer

The place of use of the educational demonstration: during the study of new material. Methodical recommendations: we recommend that the teacher, before showing the animated video, inform the students that special rules are used for the exchange of information between computers in the network - data transfer protocols.

The main protocols that ensure and control the correctness of information flow through the network are the TCP data transfer control protocol and the IP Internet protocol. They set the rules for dividing the transmitted data into separate portions (packets) (Fig. 4), and accompany them with official control information (header), which consists of the address of the sender and recipient, the serial number of the portion (Fig. 5), as well as they make sure that no errors appear during the transmission process (in case of an error, the package is sent again).

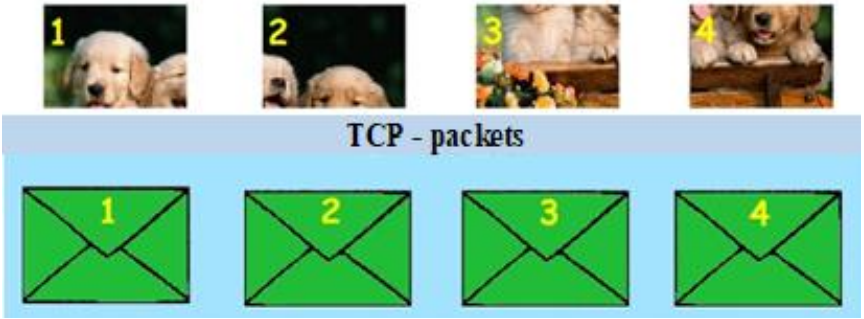

Fig. 4 Splitting data into packets

On the receiving computer, the TCP/IP protocol stack collects packets and sends information about their passage through the network, whether successful (error-free) or with errors.

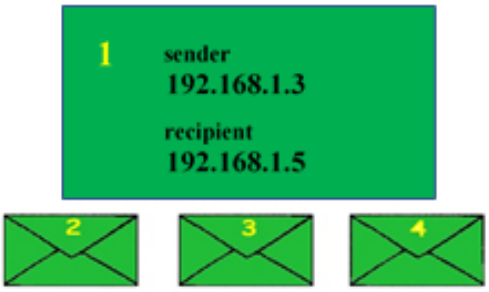

Fig. 5 Data packets

After watching the video, we recommend that the teacher conduct a discussion on the presented material to check whether the students have understood the topic and eliminate gaps in knowledge, if any.

Let's consider the video "Exchanging packets in a communication session". Place of use of the educational demonstration: when learning new material, after watching the video "Data transfer from computer to computer". Methodical recommendations: we recommend that the teacher, before showing the animation clip, informs the students that when transmitting information, the exchange session is initiated by the transmitting computer by sending a "Request" control packet to the receiving computer to check its readiness to receive data. If the receiver is not ready, it refuses the session with a special control packet, and confirms its readiness by sending a "Ready" control packet in response.

After that, data is transmitted in the form of packets.

After receiving each data packet, the receiver sends a confirmation of receipt (a special control packet "Confirmation"). If a data packet is received with an error, in response to it the receiving computer gives a request to retransmit the packet (Fig. 6).

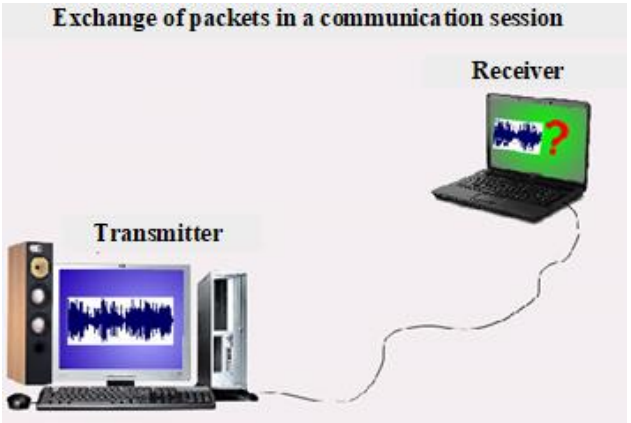

Fig. 6 Transmitting a repeat request

The session ends by sending the "End" control packet, with which the transmitter informs about the end of the connection.

The presentation "Ways of connecting a computer to the network" can be used in the after-school hours to expand and strengthen knowledge. Before giving the presentation, the teacher is recommended to inform the students that the lowest level of the computer network is the physical level, which is intended directly for the transfer of data flow. At this level, electrical or optical signals are transmitted through the cable, as well as their reception and conversion into data bits according to digital signal coding methods.

The presentation considered the types of cables with which computers are connected to the network: telephone cable; coaxial cable (Fig. 7); "twisted pair" (Fig. 8); fiber optic cable (Fig. 9).

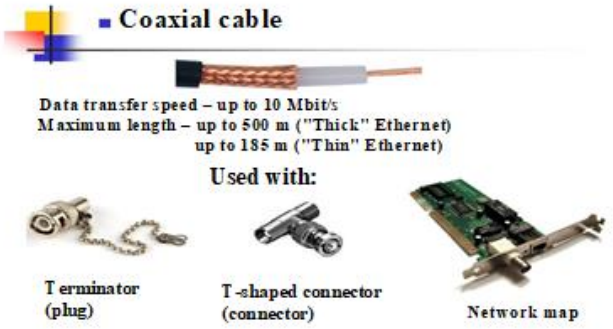

Fig. 7 Coaxial cable

Fig. 8 "The Twisted Couple"

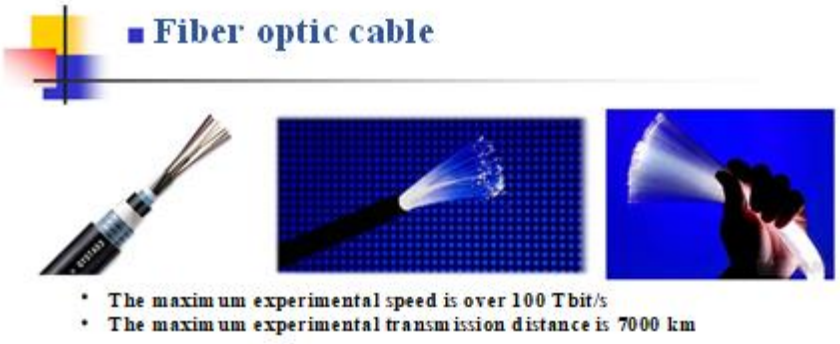

Fig. 9 Fiber optic cable

In the slides of the presentation, it is worth noting the main characteristics of the cables, as well as the devices with which they are used.

For the topic "Purpose and structure of the Internet. Internet protocols. Addressing on the Internet, concepts of IP address, domain name and URL address. Ways of connecting to the Internet, functions of the provider" two animation videos were also created: "Destination of TCP ports"; "Principle of DNS" that can be used when learning new material.

One animated clip "Client-Server Technology" was created for the topic "Internet Services. Concept of hypertext document". The place of use of the educational demonstration: during the study of new material. Before the demonstration, we recommend that the teacher remember together with the students what is called a server and a network client.

The topic "Computer networks" is quite difficult to understand, because it contains a lot of theoretical material that cannot be observed in practice. Using designed presentations and animations can greatly simplify the explanation.

Conclusions. Today, the main problem is the small number of multimedia applications that can be used while studying at school. Restructuring of general secondary schools requires not only revision and improvement of the content of general education in accordance with the new tasks of modern society, but also activation of methods of organizing the educational process. Given this, the issue of using multimedia learning tools in the pedagogical process becomes important; multimedia teaching aids help the teacher to formulate the problem, activate students' perception of educational material, ensure solid assimilation of knowledge and formation of abilities and skills of independent work of schoolchildren; multimedia demonstrations, thanks to their information richness and clarity, help the teacher to explain difficult-to-reach theoretical material and contribute to its better understanding.

The article theoretically substantiates and describes the practical application of the developed multimedia tools to the study of the topic "Computer networks". The essence of the use of multimedia technologies in the educational process is revealed, the main aspects of studying the topic are analyzed.

During the design of these demonstrations, the requirements of the computer science program for secondary schools of a universal profile were taken into account, which makes it possible to use them in the process of teaching computer science to middle and high school students.

The materials and results of the research can be used for further research of the problem, when studying the course "Methodology of teaching computer science", by school teachers in practical activities.

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