Methods Of Introducing Information Technologies Into The Educational Process Of Higher Education Institutions Of Ukraine

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Summary

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.1. Introduction

The modern period of development of a civilized society characterizes the process of informatization. Informatization of society is a global social process, the peculiarity of which is that the dominant type of activity in the sphere of social production is collection, accumulation, production, processing, storage, transmission and use of information, carried out on the basis of modern means of microprocessor and computer technology, and also on the basis of various means of information exchange. Informatization of society provides:
active use of the constantly expanding intellectual potential of society, concentrated in the printed fund, and scientific, production and other activities of its members, integration of information technology with scientific, industrial, initiating the development of all spheres of social production, intellectualization of labor activity;
A high level of information services, the availability of any member of society to sources of reliable information, visualization of the information provided, the materiality of the data used.

The use of open information systems, designed to use the entire array of information currently available to society in a particular area, makes it possible to improve management mechanisms social structure, contributes to the humanization and democratization of society, increases the level of well-being of its members. Processes, occurring in connection with the informatization of society, contribute not only to the acceleration of scientific and technological progress, intellectualization of all types of human activity, but also to the creation of a qualitatively new information environment of society, ensuring the development of the creative potential of the individual.

One of the priority directions of the process of informatization of modern society is the informatization of education - the process of providing the sphere education methodology and practice of development and optimal use of modern, or, as they are called, new information technologies (NIT), focused on the implementation of psychological and pedagogical goals of education and upbringing. This process initiates:
improving the management mechanisms of the education system based on the use of automated data banks of scientific and pedagogical information, information and methodological materials, as well as communication networks;
improving the methodology and strategy for the selection of content, methods and organizational forms of training, education, corresponding to the tasks of the student's personality development in modern conditions of informatization society;

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creation of methodological training systems focused on the development of the intellectual potential of the student, on the formation of skills to independently acquire knowledge, carry out information and educational, experimental and research activities, various types independent information processing activities;
creation and use of computer testing, diagnosing methods for monitoring and assessing the level of knowledge of students.

Informatization of education as a process of intellectualization of the activities of the teacher and the student, developing but on the basis of the realization of opportunities means of new information technologies, supports the integration tendencies of the process of cognition of the regularities of subject areas and the environment (social, environmental, informational, etc.), combining them with the advantages of individualization and differentiation of teaching, thereby providing synergy of pedagogical influence.

2. Theoretical Consideration

By means of new information technologies (MNIT) we mean software and hardware and devices operating on the basis of microprocessor, computer technology, as well as modern means and systems of information exchange, providing operations for collecting, producing, accumulating, storing, processing, transferring information.

MNIT includes: computers, personal computers; sets of terminal equipment for computers of all classes, local area networks, information input-output devices, means of input and manipulation of text and graphic information, means of archival storage of large volumes of information and other peripheral equipment of modern computers; devices for converting data from graphic or sound forms of data presentation to digital and vice versa; means and devices for manipulating audiovisual information (based on the Multimedia technology and "Virtual Reality" systems); modern means of communication; artificial intelligence systems; computer graphics systems, software complexes (programming languages, translators, compilers, operating systems, application packages, etc.), etc.

The acceleration of scientific and technological progress, based on the introduction of flexible automated systems, microprocessor-based means and programmed control devices, robots and processing centers into production, has set an important task for modern pedagogical science - to educate and prepare the younger generation that can actively participate in a qualitatively new stage in the development of modern society associated with informatization. The solution to the above problem - the fulfillment of the social order of society - fundamentally depends both on the technical equipment of educational institutions with electronic computers with appropriate peripheral equipment, educational, demonstration equipment operating on the basis of MNIT, and on the readiness of students to perceive an ever-increasing flow of information, in including educational.

The widespread use of information resources, which are the product of the intellectual activity of the most qualified part of the able-bodied population of society, determines the need to prepare a creatively active reserve in the younger generation. For this reason, it becomes relevant to develop certain methodological approaches to the use of MNIT for the implementation of the ideas of developing education, the development of the student's personality. In particular, for the development of the creative potential of the individual, the formation of the student's ability to predict the results of his activities, to develop a strategy for finding ways and methods for solving problems - both educational and practical.

Equally important is the task of providing psychological, pedagogical and methodological developments aimed at identifying the optimal conditions for using MNIT in order to intensify the educational process, increase it

efficiency and quality.

The relevance of the above is determined not only by the social order, but also by the needs of the individual for self-determination and self-expression in the conditions of modern society of the ethane of informatization.

Special attention should be paid to the description of the unique capabilities of MNIT, the implementation of which creates the prerequisites for an intensification of the educational process, unprecedented in the history of pedagogy, as well as the creation of methods focused on the development of the student's personality. Let's list these possibilities:

- Immediate feedback between the user and the MNIT;
- Computer visualization of educational information about objects or patterns of processes, phenomena, both actually occurring and "virtual";
- Archival storage of sufficiently large volumes of information with the possibility of its transmission, as well as easy access and user access to the central data bank;
- Automation of the processes of computational information retrieval activity, as well as processing the results of an educational experiment with the possibility of multiple repetition of a fragment or the experiment itself;
- Automation of information and methodological support processes, organizational management of educational activities and control over the results of assimilation.

The implementation of the above capabilities of MNIT allows you to organize activities such as.

• Registration, collection, accumulation, storage, processing of information about the studied objects, phenomena, processes, including those actually occurring, and the transfer of sufficiently large amounts of information, represented in various forms;

• Interactive dialogue - user interaction with a software (hardware and software) system, characterized, in contrast to the dialogue, which involves the exchange of text commands (requests) and answers (invitations), the implementation of more advanced dialogue means (for example, the ability to ask questions in any form, using a "key" word, in a form with a limited set of characters); at the same time, it is possible to choose options for the content of educational material, operating mode;

• Control of real objects (for example, educational robots imitating industrial devices or mechanisms);

• Control of displaying on the screen models of various objects, phenomena, processes, including those actually occurring;

• Automated control (self-control) of the results of educational activities, correction based on the results of control, training, testing.

In view of the fact that the above activities are based on information interaction between the learner (learners), the teacher and the means of new information technologies and, at the same time, are aimed at achieving educational goals, we will call it information and educational activities.

Pedagogical goals of using MNIT

Development of the student's personality, preparation of the individual for a comfortable life in the information society.

• Development of thinking (for example, visual-effective, visual-figurative, intuitive, creative, theoretical types of thinking);

• Aesthetic education (for example, by using the capabilities of computer graphics, Multimedia technology);

• Development of communication skills;

• The formation of skills to make the best decision or offer solutions in a difficult situation (for example, through the use of computer games focused on optimizing decision-making activities);

• Development of skills to carry out experimental research activities (for example, through the implementation of the capabilities of computer modeling or the use of equipment interfaced with a computer);

• The formation of an information culture, the ability to process information (for example, through the use of integrated user packages, various graphic and music editors).

Database

Database management systems (DBMS - Database Management System) have been improved throughout the development of computer technology, supporting increasingly complex levels of abstract data given by user, and ensuring the interaction of components distributed in global networks and gradually integrating with telecommunications systems. The history of the development of computer technology is the history of continuous movement from the language and communication level of the machine to the user level. If the first machines required the user to design what he needed (then there are writing programs), in machine codes, then programming languages fourth level (4GLs) allowed end-users who are not professional programmers, access information without detailed descriptions of each step, but only with built-in predefined data types - for example, tables.

The last step in this direction was object-oriented technology, which radically changed the field of software development.

Already in the 1990s. An object-oriented approach allows you to package data and code to process it together. Thus, the restriction on data types is practically removed, allowing you to work at any level of abstraction.

The evolution of information management systems went parallel to this progress, starting with low-level programs that, for example, directly read and write operations with all memory without restricting access, tape, disk cylinders and tracks; and higher-level tools such as file systems, which manipulated concepts such as arrays, records, and indexes to improve performance. Databases in your the queue began with a record and index model (ISAM, etc.), acquiring over time the ability to recover from failures, check data integrity and the ability to work multiple users at the same time. These early data models (CODASYL) were more at the machine level.

Subsequently, relational databases, which replaced in the 1980s, acquired a query mechanism that allows the user to specify what is required, allowing the DBMS to find the result in the most optimal way using dynamic indexing.

Object-oriented DBMSs (OODBMSs) have been developed since the mid-1980s mainly to support CAD applications. Complex data structures CAD systems turned out to be very convenient to arrange in the form of objects, and technical drawings are easier to store in a database than in files. This allows you to do without the decomposition of graphic structures to elements and writing them to files after finishing work with the drawing, performing the reverse operation when making any changes. If a while typical relational databases have links two levels deep, the hierarchical information of CAD drawings usually includes about ten levels, which requires rather complex operations to “assemble” the result.

Object databases were well suited to such tasks, and the evolution of many DBMSs began with the CAD market.

The CAD market, meanwhile, was quickly saturated, and in the early 1990s, OODBMS vendors turned their attention to other applications already firmly in relational DBMSs. This required equipping the OODBMS with online transaction processing (OLTP) functions, database administrator (DBA) utilities, backup / recovery tools, etc. Work in this direction continues today, but we can already say that the transition to commercial applications are doing quite well.

Object oriented databases.

Object-oriented databases have been used since the late 1980s to provide database management for applications built in accordance with the concept of object-oriented programming.

Object technology extends traditional application development with new data modeling and programming techniques. For re using code and improving data integrity in object programming, data and code for processing them are organized into objects.

Thus, restrictions on data types are almost completely removed.

If the data consists of short, simple, fixed-length fields (name, address, bank account balance), then a relational database is the best solution. If, however, the data contains a nested structure, dynamically resizable, user-defined arbitrary structures (multimedia, for example), their presentation in tabular form will be, at the very least, difficult. However, in an OODBMS, every user-defined structure is an object directly managed by the database.

In an RDBMS, relationships are controlled by the user who creates the foreign keys. The system then looks at two (or more) tables to find relationships dynamically at runtime, comparing the foreign keys until a match is achieved. This process, called join, is a weakness in relational technology. More than two or three levels of associations -signal to look for the best solution. In an OODBMS, the user simply declares a link and the DBMS automatically generates control methods by dynamically creating, deleting, and traversing links. The links are direct, no the need to scan and compare, or even search for an index, which can have a significant impact on performance. Thus, the application object model is preferred for databases with a large number of complex links: cross-references, links linking multiple objects with multiple (many-to-many relationships) bidirectional links.

Unlike relational ones, OODBMSs fully support object-based oriented programming languages. Developers using C ++ or Smalltalk deal with one set of rules (allowing the use of the benefits of object technology such as inheritance, encapsulation, and polymorphism). The developer should not resort to object model translation to relational and back. Application programs access and function with objects stored in a database that uses the standard object-oriented semantics of the language and operations. In contrast, relational the database requires the developer to translate the object model to supported data model and included routines to ensure this display at runtime. The consequence is extra effort when developing and decreasing efficiency.

And finally, OODBMS are suitable (again without translations between object and relational models) to organize distributed computing. Traditional databases (including relational and some object) are built around a central server that performs all operations on the base.

Essentially, this model differs little from the mainframe organization of the 60s. years with a central computer - the mainframe (mainframe), performing all computing, and passive terminals. This architecture has a number of disadvantages, the main of which is the issue of scalability. In currently workstations (clients) have processing power about 30 - 50% of the capacity of the database server, that is, most of computing resources are distributed among clients. Therefore, more and more applications, and primarily databases and decision-making tools, work in distributed environments in which objects (object software components) are distributed across many workstations and servers and where any the user can access any object. Thanks to standards cross-component communication (more on that later) all these pieces of code can be combined with each other regardless of hardware, software, operating systems, networks, compilers, languages programming, various means of organizing requests and generating reports and dynamically change when manipulating objects without loss performance.

Controversial points of technology.

All OODBMSs, by definition, support persistence and sharing objects. But when it comes to practical application development on different OODBMS, there are many differences in the implementation of support for three characteristics:

Integrity;

Scalability;

Fault tolerance.

Note that OODBs do not require many of the same internal functions and mechanisms that are so common and necessary in relational databases. For example, with a small number of users, long transactions and low server load, object DBMSs do not need to support complex backup / restore mechanisms (historically, the first OODBs were designed to support small workgroups - about ten people - and were not adapted for maintenance hundreds of users). Nonetheless, database technology is definitely ripe for large projects.

To illustrate the first category, consider the object caching mechanism.

Most object DBMSs place application code directly in the same address space as the DBMS itself. This achieves performance gains that are often 10 to 100 times better than separate address spaces. But with this model, the erroneous object can damage the objects and destroy the database.

There are two approaches to organizing a DBMS response to prevent data loss. Most systems pass pointers to objects to the application, and early or later, such pointers are bound to become incorrect. So, they are always wrong after moving an object to another user (for example, after moving to another server). If the programmer developing the application is punctual, then no error occurs. If the application will try to use the pointer at the wrong moment, then at best the system will crash, at worst - information will be lost in the middle of another object and the integrity of the database will be violated.

The DBMS adds an additional pointer and, if necessary, if the object is moved, the system can automatically resolve the situation (reload the object, if necessary) without a conflict situation.

There is another reason for using indirection: this allows you to track the frequency of object calls to organize an efficient swap mechanism.

This is necessary for the implementation of the second necessary property of databases - scalability. Again, the organization of the distributed components should be mentioned. The classic client-server scheme, where the main load falls on the client (this architecture is also called "thick client-thin server"), better copes with this task than the mainframe structure, but it still cannot scale to the enterprise level.

Thanks to the N-Tier architecture, the computing load is evenly distributed between the server and the end user. The load is distributed over three or more links providing additional processing power. What else does this practice lead to? “The client-server architecture, until recently considered a complex environment, has gradually evolved into an extremely complex environment. Why? Thanks to the accelerated transition to the use of multi-tier client-server systems”. Developers have to pay additional complexity, time consuming and many integration problems. Let's leave another mention of distributed components on this not without optimism note.

Local networks

A local area network is a collection of computers, peripheral devices (printers, etc.) and switching devices connected by cables. A "thick" coaxial cable, "thin" coaxial cable, twisted pair, fiber optic cable.

"Thick" cable is mainly used on long sections with high bandwidth requirements. Fiber optic cable allows you to create long sections without repeaters at speeds unattainable with other cables and reliability. However, the cost of a cable network based on it is high, and therefore it has not yet found widespread use in local networks. Basically, local computer networks are created on the basis of a "thin" cable or twisted couples.

Initially, networks were created on the principle of "thin" Ethernet. It is based on several computers with network adapters connected in series with a coaxial cable, and all network adapters send their signal to it simultaneously. The disadvantages of this principle came to light later. With the growth of networks, the parallel operation of many computers on one single bus has become practically impossible: the mutual influences on each other have become very large friend. Accidental failures of the coaxial cable (for example, an internal break in the core) permanently disabled the entire network. And to determine the place of a break or the occurrence of a software malfunction that "plugged" the network, it became almost impossible.

Therefore, the further development of computer networks is based on the principles of structuring. In this case, each network consists of the set interconnected areas - structures. Each individual structure represents several computers with network adapters, each of which is connected by a separate wire - twisted pair - to the switch. When building a twisted pair network, you can run more cables than currently installed computers. The cable is laid not only on every workplace, regardless of whether its owner needs it today or not, but even where there is no workplace today, but it is possible appearance in the future. Moving or connecting a new user as a result will only require changing the commutation on one or more panels. For networks built on this principle, there is a need for special electronic equipment. One such device is a switch (Hub) - is a switching element of the network. This connection allows improve the reliability of the connection.

Conclusions

This article provides a brief overview of the use of computer technology in education.
This article is devoted to a rather global problem for today's computer world: which software product is better and how to choose a platform for work. This topic also concerns each of us - the issue of choosing a platform for educational institutions. At this stage in the development of technology, one can only compare intuitively: like it or not.
Thus, project-based learning is the pedagogical technology that, to a greater extent than many others, meets the requirements of profile education and pre-profile training, since it encourages students to show the ability to comprehend their activities from the standpoint of a value approach: social, personal, associated with cognitive interest. , with life and professional plans;
to goal-setting focused on meaningful results;
to self-education and self-organization;
to synthesize, integrate and generalize information from different sources;
see the problem, put forward hypotheses, demonstrate intellectual skills;
make choices and decisions.
In the concept of modernizing the structure and content of education, the design and research activity of students is considered not only as a technology, but also as an important learning content. In this regard, it occupies a certain place in the experimental basic curriculum.

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