EXCELLENCIA
INTERNATIONAL MULTI-DISCIPLINARY JOURNAL OF EDUCATION
Volume 02, Issue 06, 2024 ISSN (E): 2994-9521

The Need for the Application of Ict in the Study of Physics in General Schools

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Abstract:

My research work is related to teaching physics, one of the most interesting, exciting, accessible and at the same time quite complex subjects in the school curriculum. Physics is a fundamental science that studies the simplest and at the same time the most general patterns of natural phenomena, the properties and structure of matter and the laws of its motion. Over a ten-year period of time, much has changed in the educational process, it has changed qualitatively, there has been a transition from the blackboard, simple overhead projectors and players, tasks and cards written by hand, to personal computers, multimedia projectors, printers, copiers, interactive whiteboards, digital schools with mobile classrooms, polyvalent halls, digital equipment. And it is now easier for the teacher to create new conditions for mastering educational material.

Among all academic disciplines, physics is the most amenable to computerization. The computer has been successfully used here for a long time to facilitate the routine work of performing calculations. But information technologies can also be used for studying theoretical material, training, as a means of modeling and visualization, etc. The choice depends on the goals, objectives and stage of the lesson (explanation, reinforcement, repetition of material, knowledge testing, etc.).

While teaching children physics, I began to observe a decrease in interest in the subject, and at the same time a decrease in the level of knowledge. I explained this problem by the lack of visual material, lack of equipment, lack of scientific and additional literature, and the complexity of the subject itself. The problems that have arisen are also related to the rapidly and continuously growing volume of human knowledge. In an environment where the volume of information doubles every few years, the classic textbook and teacher inevitably become purveyors of outdated knowledge. But I also noted that the number of children who know how to use a computer is growing rapidly, and this trend will accelerate regardless of the paradigm of school education. For me, the question arose: why not use the new pedagogical capabilities of the computer as a teaching

tool. A computer for students is a source of new information and a tool for intellectual and, in general, cognitive activity. Working on a computer can (and should) also develop such personal qualities as reflexivity, criticality of information, responsibility, the ability to make independent decisions, and finally, tolerance and creativity, and communication skills.

A computer for a teacher is a modern tool for solving didactic problems and organizing new forms of developmental education [1].

Let us note the general importance of computers in the educational process. They: – Fits into the framework of traditional education. – Are used successfully in educational and extracurricular activities that vary in content and organization. – Contribute to the active inclusion of the student in the educational process, maintain interest.

Didactic features of the computer:

– Information richness. – Ability to overcome existing time and spatial boundaries. – Possibility of deep penetration into the essence of the phenomena and processes being studied. – Display of the studied phenomena in development, dynamics. – Reality of the display of reality. – Expressiveness, richness of expressive techniques, emotional saturation.

Such a wealth of computer capabilities allows us to take a closer look at studying it as a new didactic tool.

Methodological justification for the use of ICT as a means of studying an academic subject. The use of computer technologies ensures *the intensification* and *updating* of the educational process based on solving the following main problems [2]:

- Identification and use of incentives to enhance cognitive activity.
- Deepening interdisciplinary connections.
- Active participation of the student in the design and further updating of his educational trajectory.

There are traditional means of teaching that serve to achieve general educational and educational goals. These include textbooks, visual aids, laboratory equipment, language (oral speech), writing (written speech), cultural achievements or works of art, and many others. etc. But these teaching aids are giving way to new developmental teaching aids. One of them is computer technology.

The computer is superior to other learning tools in a number of ways. The main advantages include: multimedia; interactivity; user-friendly interface; adaptability to the learner; independence of training content; multi-terminal; availability.

In adolescents, the ability for abstract thinking, analysis and generalization of facts and phenomena increases, i.e. to a more modern way of understanding reality. During this period, adolescents willingly accept indirect guidance in the form of advice or an unobtrusive offer to help.

Proper use of modern computer technologies in lessons makes them interesting and colorful, lively and dynamic. The development of abstract, logical thinking in children occurs through figurative thinking.

Using ICT as a means of visibility. It is known from psychology that search activity is more productive and purposeful if the educational problem is visualized ("I see and think"). Therefore, at the beginning of studying a new topic, it is very useful to present frames with a clear formulation of the educational problem (the stage of motivation and formulation of the educational problem). At the stage of updating the knowledge necessary to master new material, personnel and work with them are diverse [3]. It can be:

- diagnostic non-judgmental control, better mutual control;
- multi-level qualitative, calculation, graphic tasks;
- physical dictation, blitz survey;
- Work with systematizing, generalizing tables, logical diagrams.

When learning new material, slides together with a full-scale experiment create a single active cognitive environment in which the teacher, with a series of skillfully selected questions and tasks, excites and directs students' thoughts to new theoretical conclusions. Further, during consolidation, it clarifies, corrects students' understanding of new knowledge, and forms initial skills. In the course of explaining and consolidating new material, the frames must be varied in order to cover all aspects of cognition: an algorithm for finding a solution to a given problem, evaluating alternatives, discovering consequences and their significance in theory, etc.

Resulting effect:

- It has become much more convenient to demonstrate video materials. You can freeze high-quality footage at any time for sketching or commentary, which would be difficult when using a VCR with low-quality freeze frames. Or turn off the sound and give the student the opportunity to analyze the situation. And then, turning on the sound, check the truth of the fact. (When studying the topic "Aggregative state of matter", and "Structure of matter" in 6th grade).
- If it is impossible to conduct a "live" experiment (due to its danger, lack of equipment or specific conditions), it became possible to carry out a virtual experiment on a computer model [4].

You can view the resulting graphs. The graphs that appear on the screen when studying thermal phenomena (dependence of T on time during phase transitions, when introducing the concepts of amount of heat, heat capacity, etc.) allow a better understanding of the observed phenomena.

Using ICT as a source of additional material.

The main source of information is educational literature. The selection of additional literature on the subject is sometimes problematic, since the library collection at the school is not large. If you order literature, it will take a lot of time. This is where the computer acts as a source of information.

When preparing for a lesson, a student can use a computer as a universal source of information. The global computer information network Internet, electronic encyclopedias and textbooks, various training programs are just a small part of the information sources. To create colorful and meaningful abstracts, format reports, set notes - you can use a computer for all this.

Use of ICT as a means of conducting laboratory work.

You can also do laboratory work using physics programs. The work is more visual and efficient. Labs can be done in class or assigned as homework. By changing the parameters for each student, you can get great results in completing the work.

In a physics classroom, you can analyze the progress of laboratory work using a computer model before performing the work, or after completing the real work, conduct a computer study of the same dependence. All this contributes to the development of research skills and encourages a creative search for patterns in various processes and phenomena.

Physics lessons are characterized by a constant lack of time and complexity of equipment. A common case when the use of computer technology will be more than justified is the modeling of microworld phenomena, processes that are of colossal scale or occur in a time incommensurate with

the time allotted for their study or are hidden from the observer. Examples include phenomena in semiconductors, explosion, molecular interaction, diffusion, and cathode ray tube imaging.

Conclusion. Experience in using ICT as a new means of studying physics convinced me that the main educational goal is to create an active cognitive environment necessary for teacher-student dialogue and heuristic conversation. To organize understanding (rather than memorizing) learning through the content of computer educational materials. Everything should be built not on memorization, but on active independent practical activity, non-standard solutions. The use of ICT enlivens students' perception of the material, instills interest in studying the subject, improves creativity , and the teacher can complement, modernize, and vary the methods of application.

The use of ICT in physics lessons helps achieve the following goals:

- Activating the student's interest in the subject and the learning process.
- Development of independent work skills to find the necessary information.
- Saving time when processing large volumes of mathematical information.
- Removal of a conflict situation in case of student failure.
- Saving teacher time.
- By integrating computer technologies into the educational process, it is possible to ensure:
- development of constructive, algorithmic thinking thanks to the peculiarities of communicating with a computer and working with specialized programs;
- development of creative thinking by changing the content of reproductive activity, performing heuristic and research tasks in the environment of intelligent teaching systems and modeling programs;
- development of communication skills based on the implementation of joint projects during computer business games;
- developing skills in making optimal decisions and adapting in a difficult situation (during computer experiments based on modeling programs, when working with simulator programs);
- Achieving the level of competence in the field of computer technology necessary for the successful social and professional adaptation of the student.

Science and technology do not stand in one place; it is necessary to keep up with progress so that children feel confident in the future.

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