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New Computer-Assisted Approaches to Teaching Physics

Jurakulov Sanjar Zafarjon Oghly
Asian International University, "General technical sciences" department, senior lecturer

Abstract: Rapidly developing science and technology has made it possible to use new tools, equipment and facilities in the field of education and personnel training. Among these, computers are undoubtedly the most prominent. Research shows that this new technology has a positive effect on attracting students' attention, facilitating learning and increasing their motivation. However, due to the lack of programs in the field, there is a huge gap in the application of these technological capabilities in our country. This study aims to contribute to filling this gap and experimentally support a new curriculum that includes - to support modern physical sciences at the middle and high school level; Newly developed Simulation programs and Interactive screen experiences in the computer environment have been introduced. These programs are thought to contribute greatly to concretizing abstract topics and making them more comprehensible in an introduction to modern physics. In addition, the fact that many secondary educational institutions in our country are still not conducting these experiments due to financial reasons increases the importance of the newly developed programs.

Keywords: Computer-assisted education, Simulation programs, Interactive screen experiments, Physics education.

INTRODUCTION: When we look at the teaching methods used in secondary education, we see that "teacher-centered", "blackboard" education still dominates. This method is a "one-way" learning style that is usually guided and directed by the teacher. However, one of the general goals of education is to teach students "what and how to learn." In other words, it is "teaching how to learn". Because our era requires "lifelong learning". Even when we enter the business environment after our educational life, it becomes increasingly important to update our knowledge and add new ones. In addition, for successful education, it is necessary not only to "hear", "read", but also to "understand", "understand" and "apply". In Western countries, in the 60s, a new teaching method began to attract attention: the use of technological tools and equipment in education. From a didactic point of view, this phrase covers all technical course materials that a teacher can use in a lesson. These are; There may be an overhead projector, lecture films, television, internet and computer.

The role of educational technologies in education

According to Kerres; Some of the functions of these technological opportunities from the teacher's perspective can be listed as follows:

- Support the teacher in the presentation of information in the classroom
- Use in course preparation to increase success in courses taught by the traditional demonstration method.
- Support problem solving and improve information continuity.

In addition, the technologies used are not only suitable for supporting the process of teaching new information, but also for drawing students' attention to the lesson, increasing their interest and passion for the subjects being taught. Thus, the classes attract students with different interests and abilities. Research has shown that the use of technology in education and training radically accelerates and facilitates learning. For example, a study conducted in Germany in 1998 with the support of the Bertelsmann Foundation reached the following conclusions:

- 90% of lessons are becoming more lively with the use of educational technology
- 80% stated that lessons are more interesting with the help of educational technologies
- 59% stated that the courses were more effective with the help of educational technologies.

Similar studies conducted in the United States of America have found that technology-assisted students are 3 times more successful in math classes and 2 times more likely to be in biology compared to traditional teaching methods. The learner (student) in the technological applications described so far can be passive or active. It is divided into two: In the passive state, the learner listens to the subject on a cassette or watches an educational film on TV. Subjects to be studied are often determined by the teacher, and the student is not expected to actively participate in the learning process. can select information and apply it, for example: using simulation programs in a computer environment. Thus, mutual (interactive) interaction takes place between the thing to be learned and the student. As a result, the learning process is expected to be more effective than when the student is passive.

Learning by doing

In Computer Education; The interaction between the studied subject and the student is achieved by giving the computer user (student) the opportunity to intervene in the educational process and direct the learning process. According to Issing, there can be interaction between computer and reader only if the following conditions are met:

- A student must first be a creator. In this way, he can organize the content he needs to learn and create it independently.
- The computer program must be dynamic and able to respond to the actions of the learner.
- During the learning process, the student should control his knowledge.
- The program should guide the reader when necessary in using the program.

In the classical teaching methods, changes occur mainly in the cognitive and affective spheres, while in practical learning, as a result of the active participation of the student in the educational process, active changes are also observed in the psychomotor sphere. Conducted research; It shows that people get 10% of what they learn by reading, 20% by hearing, 30% by seeing, and 90% by doing.

Two points highlight the importance of interactive learning: First, interactive learning plays an important role in "individualized learning" by selecting the information to be learned and personalizing the learning process. . This new role helps the learner develop self-confidence and personal responsibility. Interaction also increases "interest and motivation to learn." According to Strzebkowski, this is the result of the student's active participation in the learning process. Examples of these technologies include many simulation programs and interactive screen experiences, whose features we will discuss below. provides student activity and one-on-one (interactive) interaction with the computer.

Simulation programs

Various intervention options in simulation programs, such as the ability of the user to provide different starting values in an experiment in a computer environment, allow students to "learn by discovery", one of the different learning methods. In simulation programs, the student

consciously plays an active role. Simulation programs are usually used to simulate experiences in everyday life that cannot be implemented for various reasons (for example, they are too fast or too slow, too expensive). They are preferred, for example, when evaluating data collected in experiments and making them more understandable (for example, graphically).

Interactive Display Experiments (IED)

Interactive display experiments (IEDs) were first used in 1997 in a service course (Physics for Engineers) with a large number of students as part of the "Living Physics Book" project developed by Kirstein and Rass at the University of Berlin, Germany. Interactivity (interaction) in these experiments; This is achieved by allowing the user to intervene in the experience performed by the program on the computer screen. As in video films, the images that appear on the screen in IED are "real". That is, instead of pre-made and customized graphics and images as in simulation programs; IEDs consist of taking pictures of each step of the experiment with a digital camera and combining them in a computer environment. However; The difference from video films is that the student "performs" each stage of the experiment on the computer screen with the help of a computer mouse: The experiment stage begins by "pressing" the "next" button under the computer screen. step by step. In other words, the user, unlike a passive video viewer, can actively intervene in the process of the experiment, adjust the experience to a slow or fast pace, or even go back to the previous stage of the experiment by pressing the "back" button.

Summary: Commonly used as technological tools and equipment in education and training, the most important features of computer software can be easily used anywhere, anytime, without much time.

They are often based on interactive interaction. Because these programs are recorded on CDs or floppy disks, they can be performed and repeated in a quieter environment, both in the classroom at school and at home. In this way, the spread of the educational environment outside the school is increasing. However, despite all the mentioned advantages, it is another fact that these technological tools are not used enough in secondary educational institutions. One of the most important reasons for this is the lack of programs that include field subjects. In order to contribute to filling this great gap and experimentally support a new course concept involving modern physics at the middle and high school level; Interactive screen experiences in a computer environment

- e/m determination
- Frank-Hertz experiment
- Photoelectric effect
- The Compton incident
- Electron diffraction tube experiments and simulation programs
- Designed as two-slit experiments.

Since atomic and molecular phenomena cannot be seen and imagined with the naked eye, the difficulties in making these phenomena concrete and the high cost of experimental devices increase the importance of these applications.

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