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ROLE MODELS OF INTERACTIVE LESSONS IN TEACHING PHYSICS

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Abstract: *The computers usage and the application of teaching strategies based on new technologies in educational activities contribute to developing new forms of organizing teaching which are not possible by traditional means and methods. Computers'abilities of processing, recording and retrieval of information determine entering situations where the student acquires knowledge and skills independently, in accordance with his own interests and aspirations. The processes suggested by multimedia lessons for various disciplines represent a way of learning that involves understanding and explaining the content, but more, a mechanism of building a chritical thinking. Information is presented in order to stimulate alternative and open interpretations, being a means of forming competences, values and atitudes.The impact studies conducted on the occasion of introducing different types of educational software in schools demonstrate their utility, the target is especially the students' learning progress, with comparable results, regardless of their original level. The study of physics can be achieved through a methodological variety . The computer entering in the classroom allowed the appeal, through CAI (Computer Assisted Instruction), to simulation software (interactive models), which prove to be particularly useful in studying this subject, because the simulation is interactivity, modeling, visualization in scientific field, it is a way to obtain the image and study of different models, processes or phenomena inaccessible to direct observation.*

Keywords: *educational software, learning, computer assisted instruction, interactive models*

I. INTRODUCTION

Computer use and application of new technology-based teaching strategies in educational activities contribute to the development of forms of organization of training not possible using the methods and traditional means. Possibilities of computer processing, recording and retrieval of information triggers the situations in which the student acquires knowledge and skills independently, in accordance with the interests and aspirations. Computer Aided involves direct intervention in the organization of computer learning situation through an educational software. Field studies show that using computers in practical work and laboratory learning efficiency increases by about 30%. [1],[5]

Educational software is a program designed for use in teaching - learning - assessment as a means of interactive learning, providing opportunities for individualization. It is made according to certain educational requirements (specific content, target group characteristics, behavioral objectives) and certain technical requirements (preparation of individual interactions, feedback and formative assessment sequence).

After the priority function that can meet the training process can be divided into educational software: software interactive software to exercise (Drill and Practice), simulation software, computer models of laboratory work, theme software, software testing / evaluation of knowledge, software tools, educational games.[2],[5]

II. SIMULATION SOFTWARE (INTERACTIVE MODELS)

Simulation software (interactive models) allow students to observe the monitor screen representation of a controlled trial or a real phenomenon, based on a simplified model. The simulation

aims at training the students' mental models of phenomena, processes or real systems, enabling them to understand their formation and functioning. By design, the software allows you to modify some parameters, the student can see how it changes the behavior / response system. In some cases, interactive model can replace the real experiment, especially if the experiment is dangerous and requires expensive equipment (laser operation of a movement of the planets and artificial satellites, operating a nuclear reactor, etc.). Interactive models provide a saving of time in preparing lessons and during lessons. With their teacher present phenomena, processes, etc.., More intuitive and can demonstrate some features of phenomena and processes. This increase student interest in physics and promote a deeper understanding of them. [1], [2],[3],[5]

Computer modeling allows the scaling of time, varying in a wide range of parameters and experimental conditions and model situations that can not be achieved in a real experiment. Some models allow you to display on-screen graphics showing time dependence of physical quantities describing the experiment, while conducting the experiment, which facilitates understanding of dependence of physical quantities that characterize the phenomenon or process studied. [1]

The computer provides unique visualization capabilities that can not be achieved in a real experiment, the theoretical model connecting the successive factors coming model natural phenomena. Using interactive models allow the creation of dynamic images on the screen of experiments or phenomena. [1]

Interactive models can be used effectively in lessons so they may be proposed by students to conduct interactive research model and to establish certain conclusions. In this way students acquire knowledge through independent creative activity, and this knowledge are useful for obtaining a concrete result, observable on the computer monitor. The teacher's role is to guide the work of individual students to acquire new knowledge. Also, the solutions obtained urn problem solving can be experimentally verified by computer. Possibility of verifying individual experiment with computer solutions increase students' interest, turn them into a creative activity and scientific research approaches. Students begin to propose their own problems and check solutions using computer experiments, and the teacher has the task to stimulate the students for this activity. [1], [3]

Using interactive models using computer should not be regarded as an attempt to replace physical experiments with the real simulations, because the number of physical phenomena studied in school and can not be presented with a demonstration experiment is large enough. [1]

Among the advantages of this type of experiment the following: can be used as a demonstration experiment, allows varying the values of physical quantities quickly covered the teacher than a budget for the preparation of the laboratory is a short period of time necessary to collect experimental data in view of processing, the student is placed in a position to do much of the assembly, allows the experiment in the absence of equipment, which can be oportunity schools with poor equipment. The limits of this type of experiment are: inability student to explore a real phenomenon, to make contact with real devices, achieving a perfect experiment, the impossibility of identifying sources of errors that occur in real experiment.[1],[5]

The simulation aplication that i used belong to AEL platform – lessons of physics, which include animation and working tasks. Thus, we can conduct an experiment aimed at composing forces and determining notions that are described in this system.

Figure 1 shows such an application named „The components of gravitational forces on a inclined plane” [6]

By realizing the virtual experiment, students will set the gravitational vector and the force vector so that the body remain at rest. Once set in the center of symmetry of the vehicle, the two vectors must be decomposed on the axes Ox and Oy to enable calculation of gravitational components, ie components of force. After analysing the system of forces, they will use the 2nd principle of newtonian mechanics and they will compute the values of the force and of the gravitational force.

Simulation software, from the most simple to the most complex challenge permit discussions that can be guided by the teacher. [7]

In order to illustrate, in Figure 2 it is suggested an application that proposes several issues, one being determining the conditions under which the body in the plane is at rest in the absence of friction.

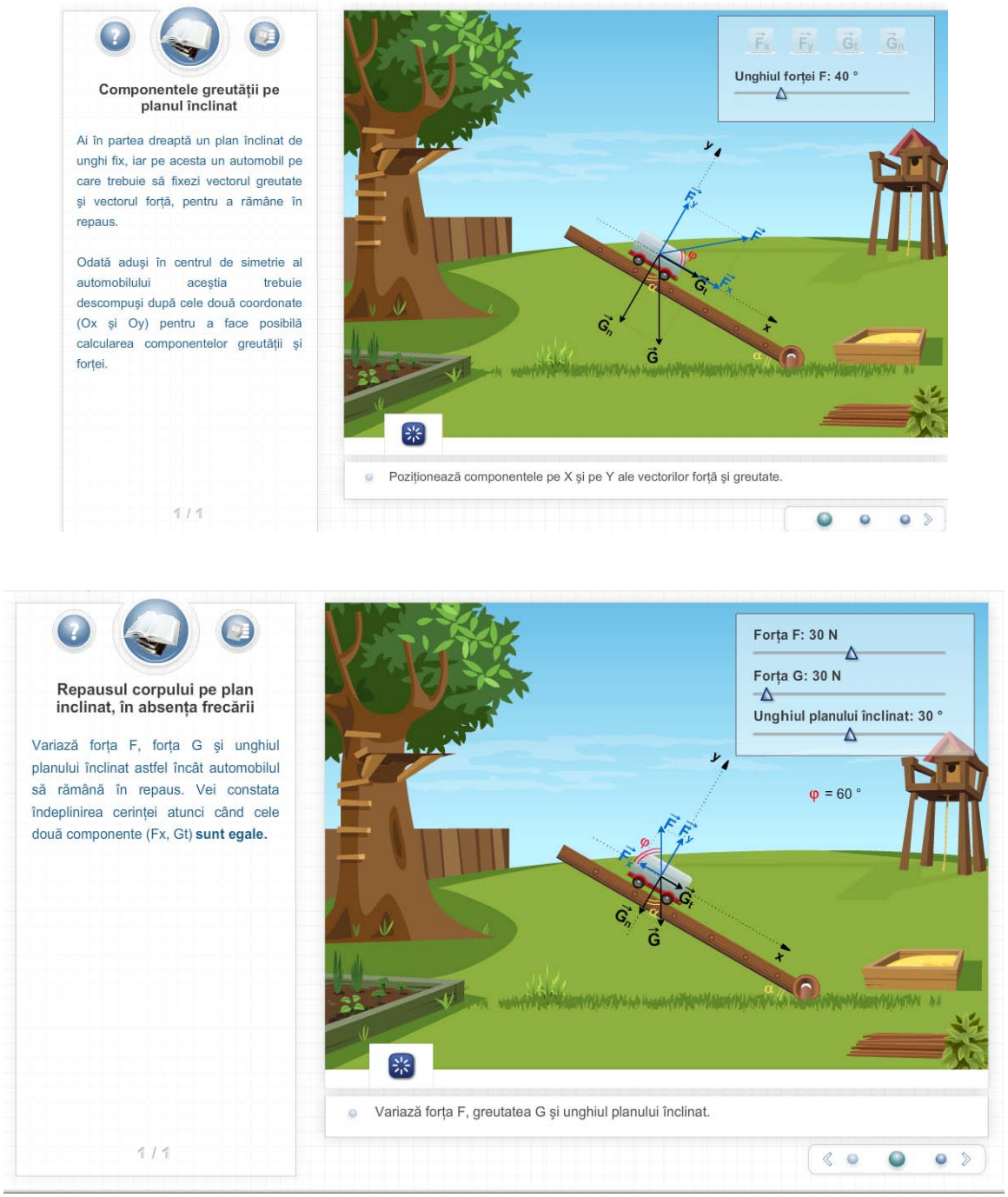


Figure 2. Body resting on an inclined plane in the absence of friction [6]

With the objective of confronting the student with various methods of investigating, trying at the same time to practice at your own pace, we used more applications which helped the student to go through the main steps of performing an experiment, from knowing the principle of the method of working mode, recording experimental data, designing an algorithm for processing them, the conclusions.[7] Figure 3 presents an application that can be used when studying electrical resistance, being proposed a simulation experiment to determine the additional resistance of voltmeters. Using such an application, before performing the laboratory experiment, the student can adjust to the working mode, to the data processing possibilities, discussing the solutions presented by students being important for the success of the laboratory experiment. By proposing students to achieve these applications, they have to solve a physics problem, practicing in the same context more competences.

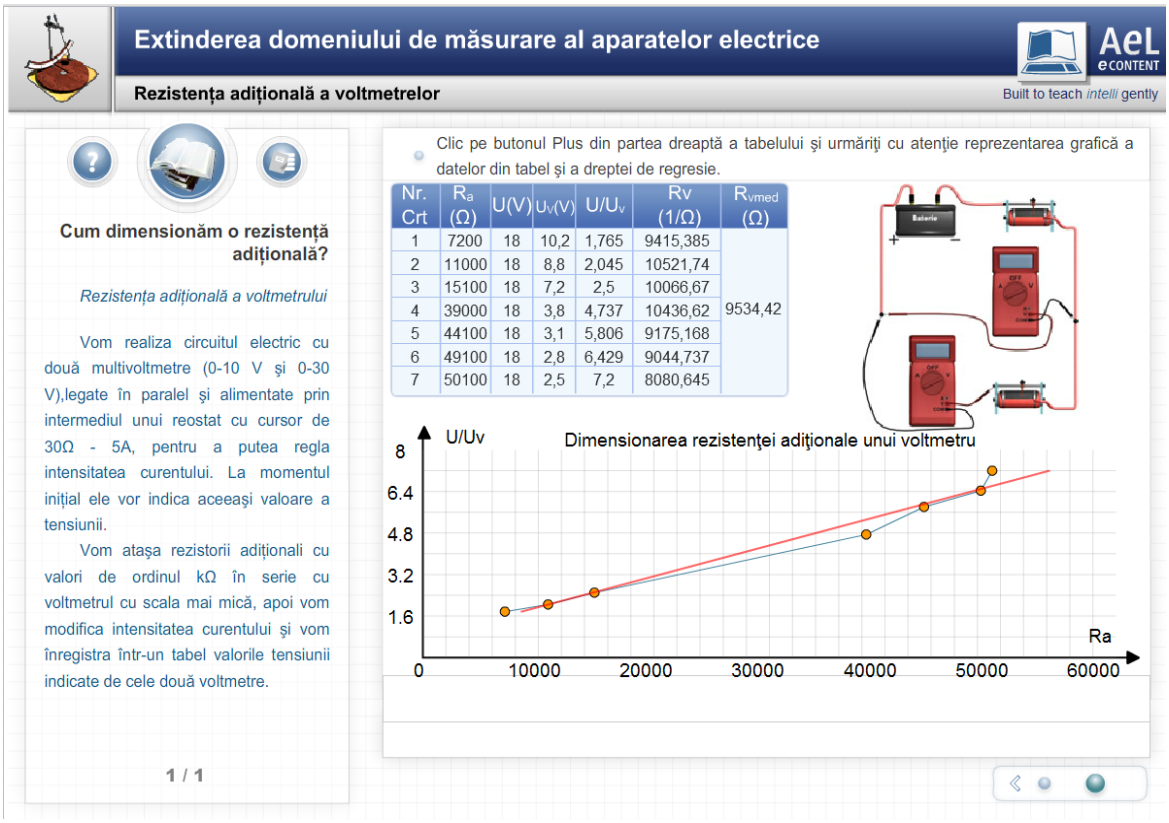


Figure 3. The additional resistance of voltmeters [6]

III. PERCEPTION OF TEACHERS ON THE CAI IMPLEMENTATION IN PHYSICS LESSONS

Assuming that the computer-assisted learning is a teaching strategy that proved its efficiency in teaching-learning-assessment of physics, I tried to investigate the modality of implementing the interactive teaching strategy in the practice of the educational activity.

In this respect, we applied a questionnaire on a sample of 34 physics teachers in Vrancea county. The sample of subjects is structured as follows, depending on the length of service in teaching and the didactic degree as a variable:

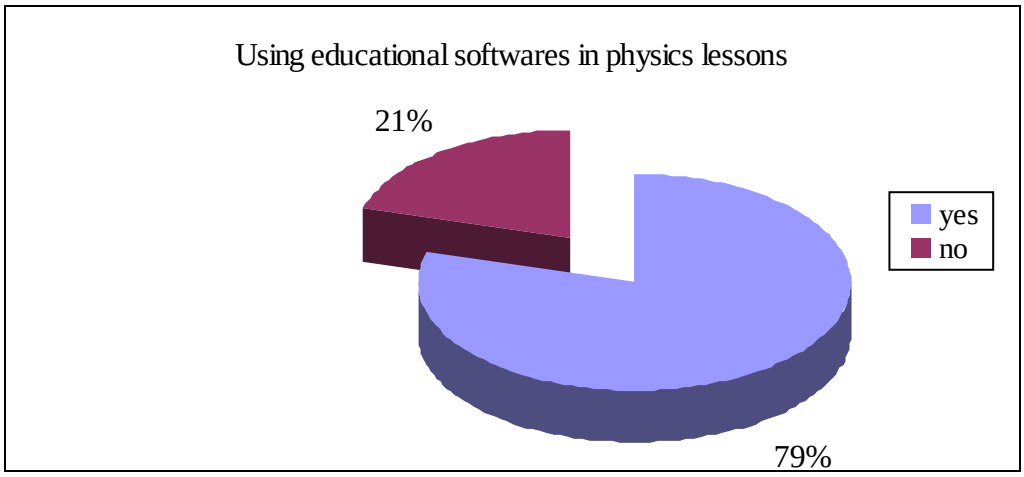
Tabel 1. Sample distribution of subjects according to age in education

Length of service in teaching	**No. Teachers**
under 5 years	2
5-10 years	6
10-20 years	12
over 20 years	14

Tabel 2. Sample distribution of subjects according to the didactic degree

Didactic degree	**No. Teachers**
No didactic degree	1
definitiv	4
Grad didactic II	8
Grad didactic I	21

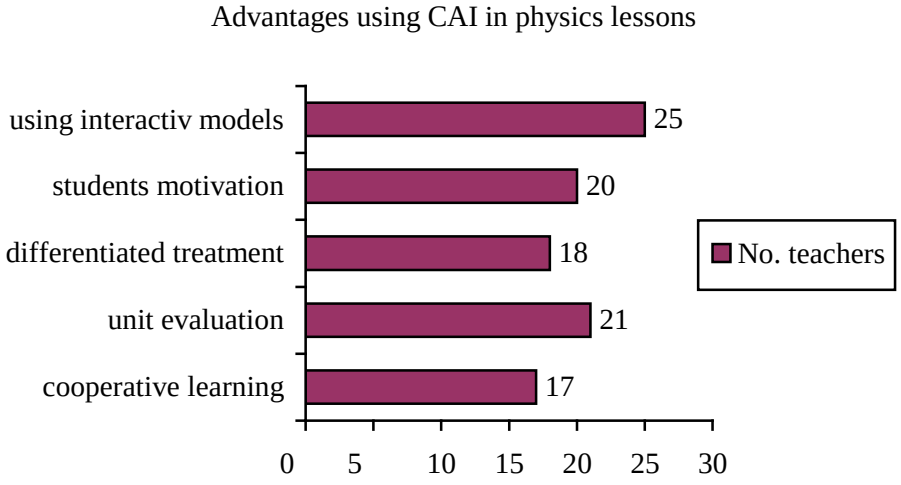
The question "Do you use educational software in Physics courses?" was answered ‘Yes’ by 27 of the subjects, showing that teachers are interested in finding ways to improve educational activities.



In the discussions with teachers, they justified their non-involvement of students in computer-assisted activities by the lack of computers (an insufficient infrastructure) and the lack of software or by the problems created by the Internet connection (introducing computers in educational activities is conditioned by equipping the classrooms and laboratories) Two respondents noted that such activities require a different approach to classical lesson and pedagogical training and working with computer skills do not allow them to carry out such activities.

In conclusion, most teachers showed their willingness to detach from the classical way of teaching, to change their teaching style, using an innovative approach to lessons by integrating information and communication technology, provided that material basis of the school allows.

Among the advantages of using CAI in physics lessons, the most frequent were:

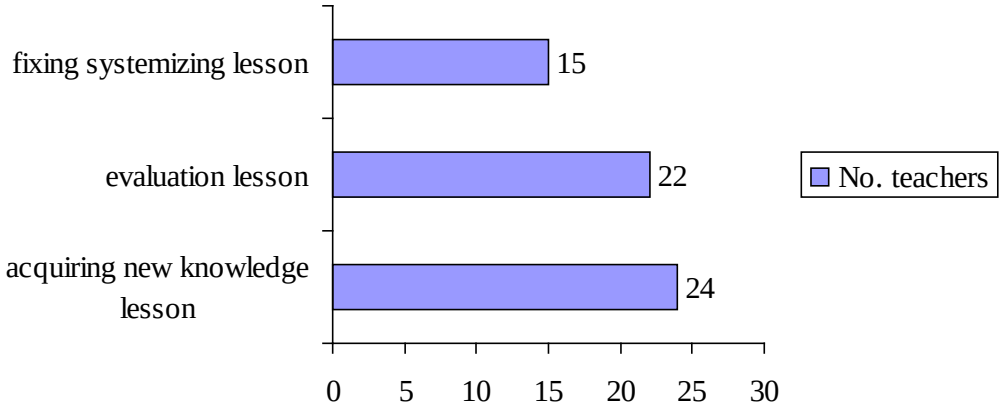


One of the cases in which CAI presents some advantages in comparison with other instructive and educational strategies, it is the majority opinion, the use of interactive teaching models, with the role of presenting the physical phenomena. Thus, the virtual experiment will facilitate the understanding of dynamic processes of great complexity, of understanding some phenomena difficult to simulate in practice or laboratory. Also, according to the respondents, another advantage of using computer in lessons is to attract, motivate students, to develop the interest in discipline and study and thus to increase academic performance. At the same time, the use of educational software during lessons offer students to learn through self-paced tasks, personal style, and in addition, some of the content can be revealed through discovery, as a result of interaction with them. Most of those using CAI in class noticed that evaluative processes become uniform there may be a simultaneous evaluation of the class, while increasing the objectivity, but with an optimum adjustment, allowing immediate

feedback. As noted by teachers, the use of new technologies creates the opportunity of involving students in collaborative activities, cooperation, which permit the development of teamwork skills. Thus, teachers identified and found advantages of using CAI to approach physics as a discipline of study in higher education.

Regarding the types of lessons that can be effectively used with interactive models, teachers surveyed opted mainly for lessons on acquiring new knowledge and to the evaluation.

Types of lessons where are used interactiv models



Such a choice may be justified:

- in the lesson of acquiring new knowledge students are offered to carry out using a small interactive research model and to establish certain conclusions. Most of these models allow to undertake this research in a short time. Students thus acquire knowledge independently, at your own pace from their investigations, the teacher assuming the task of guiding the work of individual students to acquire new knowledge. Such a lesson assumes that each student access to a personal computer.
- in the lesson of Assessment of knowledge and skills students can be offered for solving problems whose solutions can be verified experimentally by computer, which leads to increased student interest to activity.

IV. CONCLUSIONS

Although the school is often characterized as an institution resistant to change, conservative teachers show their willingness to integrate educational activities of modern elements to ensure a better understanding of the content conveyed by the students and with immediate effect to facilitate the act of learning. The Computer Aided Learning (CAI) is constituted in a type of individual student learning through educational software that directs the student step by step journey from ignorance to knowledge through its own efforts and in the pace of learning. Therefore, the software of simulation models provide an excellent basis of interactive demonstrations and dynamic multiple representations of phenomena, of realizing the fundamental knowledge or taking laboratory tasks in respect of breeding experience or complements on them. Simulation exercises of this type offer great possibilities in the presentation and analysis, in the issue of assumptions, imaginary solutions in exploring other ways of collecting hidden data.

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