TO USE THE COMPUTER – A BETTER WAY TO UNDERSTAND PHYSICS

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Abstract: Physics laboratory has for a long time now been an important part of school physics education. The role and contribution of Multimedia (MM) to teaching/learning of specific physics topics and integrated MM activities in school work, in home-work and in distance learning it is most important.

In first parts, we explained why important to use MM, and I presented the modern tools and classified it. In succeed step, we propose a Delineate of the lesson plan and we are illustrated how the teacher can by integrated audio – video tools on instruction in diverse stage of unit by learn.

1. INTRODUCTION
Our society is a technologies society. Important informative changes require modernizing the educational programs. To use the Technologies of Information and Communication introduce Physics in a modern and attractive way. Multimedia in Physics Teaching has one important impact for the teaching/learning process. (Iskander, 2002), (Esquembre, 2002), (de Jong, 1999), (Almeida, 2003).

The Computer Assisted Instruction stimulates the visual and hearing memory and transposes the student in the midst of the Phenomena. All the science phenomena that are interesting to be attached with simulations, animation, and interactivity have especial interest for us. The simulations can face issues that are difficult to be treated by other ways because their abstract character or because their needs for animation. Many examples can be found in field like the introduction of mechanics, optics, electricity, thermodynamics etc.

The modern aids used in Physics classes are the subsidy lab, the textbooks, the exercise books, the board and the calk, audio and video equipment, calculation means and instruments, means of evaluation, means of planned teaching. The training films or the lessons on the computer are the most representative. The realism of dynamical pictures, the video joined with the sound and the motion, the possibility to recreate the physical reality with cine-technique, digital technique or, lately, with computer technique make the didactical movie the most important teaching aid. The movie must integrate in the class, as teaching tools and not as an intention. It will be used in a special stage of the lesson, according to the logical structure or the strategies involved.

2. MODERN TOOLS USED IN PHYSICS
The modern tools are general instruments, devices, school supplies that are adapted and selected to process and transfer information and to assess the results. They must disseminate and assimilate the information, but also to estimate the results. They are specially invested with pedagogical functions, with a view to communicate, reinforce knowledge, evaluate and apply practical knowledge.

Due to the great progress of the informational technology in the past decade, the Multimedia technologies occupy a very special place. Modern technology refers to video spotlight, electronically board, adapted software for Physics or other software that can be used during the Physics classes.

The modern tools are classified in (Tereja, 1994):

a. informative-demonstrative tools:
   - logical – intuitive natural tools (instruments, appliances, machines, installations);
   - special made objects (models, simulations);
   - imagistic substitutes, figurative representations (pictures, explicative sketches on the board, drawings, diagrams, plotting…);
   - projected representations (slides, movies, videos, didactical TV movies, computer representations made in PowerPoint, Excel…);
   - logical – rational tools and symbols (electronic schemes, Physics formulas or laws).

b. investigation, exercise and skills forming tools:
   - physics lab equipment;
   - measuring instruments, consumables;
• technical equipment (projectors, retro projectors, video camera, other projector devices);
• devices and instruction equipments (computer instruction).

c. beyond pedagogical specific, the modern possibility can be classified in this mode:
• equipment physic lab;
• audio – video devices and specific technical equipments;
• experimental design, test models, diagrams, instruction models, mathematical models, evaluation tests.

3. THE MULTI – MEDIA TOOLS AND SCHOOL EDUCATION

The multimedia tools are technical equipments that permit the stock up of the sound or the image and their future reproduction (Nicola, 1994), (Popa, 2005). Multimedia tools are a support to the teaching/learning process in different topics.

The integrated Multi – Media tools expand the teacher and the student's possibilities in the class. Movies, TV shows, video recording, CDs or DVDs are dynamical tools that are capable to represent the physical process afterwards. The static tools are slide projections.

The audio – video tools are irreplaceable in the class because of the next characteristics:
- They admit convenient modifications to the temporal or the spatial scale; it is possible to observe the slow phenomena or the speedy ones; we can observe the microscopically phenomena or astronomical phenomena.
- They can to operate, analyse, synthesize the physic reality; they encourage the basic understanding. They permit a better perception of direct observations.
- They admit the transition from the general to the particular and reverse; the flash back encourages the understanding and consolidation of knowledge.
- They divert the students' attention from important aspects in a convenient order.

We can use this modern aid together with the traditional one; they are complementary and they do not exclude the didactical experiments. Together with other tools, they diminish the learning effort for students and also the teacher's effort to coordinate the learning process. Of course, there are few drawbacks, because the student is passive, he is a simple information receiver and the pictures shown in excess can block the general intellectual development. I refer to the student's abstract thinking and to the student's rich and diverse language. The student must learn to translate the message and he can instruct and teach himself.

To forestall these inconveniences, the teacher, during the class, can ask different questions, can stress few special important moments. In this manner, the student's attention is orientated, his thinking and his data processing capability are mobilized. The students are invited to observe the detailed elements that aren't easily recognizable. The teacher can initiate the analysing process, the synthesis process, the comparison, the reasoning; conversation is the most important method associated with these processes during the class.

The student's inactivity can be eliminated by discussions, debates in class, by the quality of teacher's tools, by continuity between ideas, by picture rhythm; all these allow students to fully understand every picture messages and to process them.

The pictures are more suggestive; the students can think that they understand but this lasts a moment and is apparent; the teacher must insist for a good feed-back, in order to get over superficiality.

The training films or the lessons on the computer are the most representative. The realism of dynamical pictures, the video joined with the sound and the motion, the possibility to recreate the physical reality with cine-technique, digital technique or, lately, with computer technique make the didactical movie the most important teaching aid. The movie must integrate in the class, as a teaching aid and not as an intention. It will be used in a special stage of the lesson, according to the logical structure or the strategies involved. Before the didactical movie or the PowerPoint slides, the teacher must talk to students, to prepare them for an optimal reception on the message.

4. COMPUTATIONAL BACKGROUND

4.1. AEL SYSTEM

The IT-Based Educational System (SEI - from Romanian “Sistem Educational Informatizat”) is a complex program initiated by the Ministry of Education, Research and Youth (MERY) and its basic objective is to support the teaching/learning process in the pre-university education system
with cutting edge technology. (http://www.advancedelearning.com/index.php/articles/c3) AeL is a computerized Educational System (SEI), created by Siveco Romania. AeL offers support for teaching / learning, assessment and scoring, administration, planning and monitoring content. It also provides the means of communication and synchronization between local and regional centres within the SEI program. (http://portal.edu.ro/index.php/articles/20?catid=142)

AeL allows viewing and managing educational content such as interactive materials, tutorials, exercises, simulations, educational games. Library of educational materials is adaptable, configurable, index and allow easy search. Educational AeL is a complementary (and not one alternate) classical teaching methods. (Figure 1)

Figure 1 (SIVECO)

SEI optimizes the learning synchronous because the teacher can control the whole lesson, to create, coordinate and monitors the educational process. The tests are integrated with the study of schedules of students, keeping track of the evolution of each student.

“Advanced e-Learning Objects are an excellent example for a new approach to e-Learning. The digital material can be used in various learning environments, and it covers a huge range of subjects: Mathematics, Physics, Chemistry, History, Biology, Computer Science, Geography and Technology. The product gives the teacher great flexibility and is an excellent tool that promotes a student-centred approach. It has a very nice and clear design that significantly contributes to the understanding of the content. Rich in multimedia features, the product is a best practice example for new trends in e-Learning“. (http://www.advancedelearning.com/index.php/articles/c311/en)

AeL is conceived as an ongoing support that allows learning in the classroom but also as a product of the future, offering students the opportunity to learn anywhere and anytime.

4.2. CROCODILE PHYSICS

The audio – video tools are technical equipments that permit the stock up of the image and their future reproduction (Nicola, 1994; Jinga and Vășceanu, 1989).

The software that will be used is Crocodile Physics 605, is dedicated simulation software for physics experiments.

The simulation will be in front, the teacher will present it on the electronic board or video projector. If the school has a physics lab with a computer on each table, the experiment can be practiced by each student.

5. CONCRETE RESULTS

Lens - Delineate of the lesson plan
The unit by learn: Geometrical Optics
The form (gradual level): the class-9th grade (the student’s age – 15 years old)
The name of lesson: Lens
The type of the lesson: thoroughgoing study of learns
The didactical tools: video, TV, videocassette—application of *Lens*, the training films or the lessons on the computer, experimental kit and after, completed with simulation on the computer AeL system soft (Figure 2, Figure 3) or Crocodile Physics (Figure 4).  

The didactical intention: teaching the notion of lens and construction of images in convergence lens.

Instructions for students: Independent activity.  
- The teacher will verify the knowledge, which the students must learn - The reflection and refraction of light. ([http://www.advancedelearning.com/index.php/articles/c323](http://www.advancedelearning.com/index.php/articles/c323))  
- The teacher will make connection with the new lesson.  
- The teacher and the students start a practical activity – optical kit.  
- The teacher and the student use Lesson on AeL System (figure 2, figure 3), or simulation on Crocodile Physics (figure 4). The simulations are similar with the practical activity, and the students must observe, practice and draw conclusions.

![Figure 2](SIVECO)

- The teacher must guide the students to draw conclusions, to generalize their observations.  
- The teacher observes that the students draw correctly the diagrams and write the equations and the definition in their notebooks.  
- The students identify application for *Lens – The Eye – Optical Instrument.*

![Figure 3](http://www.advancedelearning.com/index.php/articles/c323)
6. CONCLUSIONS

A good lesson, a successful one is achieved when the teacher and the students work together. The teacher must choose the appropriate teaching methods, types of activities and interaction by taking into account the level of his/ her students, the materials he/she has and the goals. Activities can include so traditional experiments and other modern tools, like audio – video tools, when the students must observe, practice and draw conclusions. Methods used must vary, according to the topic, the students’ response or moment of the lesson where they are used. It is good traditional and modern methods as well, like: demonstration, problem-solving, observation, conversation, learning through discovery, modeling on the computer, didactic games on the computer or practical games. The lesson will prove to be successful if the students understand the concepts and use them in exercises and problems. The teacher can avoid improvised or useless activities and stimulate his students to progress gradually, by avoiding boredom and lack of interest, wasting time and effort. The lesson must contribute to their systematic knowledge and to their maturity. The information they learn must be used in everyday life, so that teaching and learning can connect with their life.

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