

# E-LEARNING AND CURRICULUM AT SCHOOL'S DECISION THE ROLE OF CDS IN OBTAINING PERFORMANCE AND DEVELOPING STUDENTS' CREATIVITY

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**Abstract.** The educational system in Romania keeps the pace with the development of communicational infrastructure, according to International Telecommunication Union 2000 which shows that the number of users in Romania increased from 2.67% in 1999 to 4.46% in 2001 and now about 7% in 2010. This is a necessity to the need to adapt the teaching – learning – assessment to the current requirements of advanced education, SEI platform that has extended nationwide.

Thus, in every school, in order to implement new information technologies, there has appeared motivation in the educational process in order to develop the creativity of students.

Each strategy allows each school to develop a school's curriculum. Our school trains graduates to help get the software developer certificate. There are mixed teams of teachers and students who make educational software integrated in the optional course “The development of didactic IT tools for the teaching of sciences“. Period of the course: two years (1h/week) for 10<sup>th</sup> and 11<sup>th</sup> grade.

**Keywords:** educational software, interactivity, performance, creativity, teamwork, e-learning.

## 1. Introduction

The objectives of this course are:

- Forming and developing the skills of using modern means of communication, using new technologies, in the context of the need to form a “digital culture“, as an essential element of the minimal qualifications of students;
- Using software applications specialized for development of educational soft: Flash;
- Identifying the connections between computer science, chemistry and physics;
- Planning scenarios and building stages to explain phenomena, processes, procedures;
- Modeling physical and chemical phenomena, as well as making experiments in virtual laboratories which permit a better understanding in case the experiments cannot be analyzed in the school's real laboratories;
- Processing experimental data obtained from observations or through experiments, which can be processed according to the proposed goal, using adequate computer programs.

The final product is to develop a virtual platform which will include “DIDACTIC-VIP”: supporting courses, virtual interactive lessons, teaching projects that include concrete ways of implementing ICT in education.

These software are acknowledged by OSIM and having won awards, assert the professionalism and indisputable success of the course.

## 2. CURRICULUM AT SCHOOL'S DECISION

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## 2.1. National curriculum

The need to adapt the teaching-learning-evaluation process to the requirements of a qualitative education has led to the development of SEI PROGRAM nationwide. Each school develops its own EDUCATIONAL OFFER, implementing, aside the NATIONAL CURRICULUM, its own CURRICULUM AT SCHOOL'S DECISION.

Each school's curricular project includes all educational processes and learning experiences that the school is offering the students directly. Therefore, performance can be achieved by constructing individual methods of learning through a flexible offer, adjusted to the school's profile and specifics[1].

Starting from 2003-2004 school year, in the curriculum areas "MATHEMATICS AND SCIENCE" and "COMPUTER SCIENCE" our school has been providing the optional course: "THE DEVELOPMENT OF IT DIDACTIC TOOLS FOR TEACHING SCIENCES (PHYSICS and CHEMISTRY)". The optional course addresses tenth and eleventh graders and it is spread across four semesters.

The course is organized to be held by teachers of computer science but also by teachers of physics and chemistry. The final product is THE VIRTUAL DIDACTIC PLATFORM – VIP which consists of [2]:

- Supporting course materials;
- Lesson plans in which there are integrated ICT-based lesson stages;
- Educational software, whose authors are teachers of "Tudor Vianu" National High School of Computer Science;
- Methodological suggestions on how to utilize the created educational software.

## 2.2. The presentation of the optional course "the development of it didactic tools for teaching sciences (physics and chemistry)"

This course targets students who wish to participate in the development and creation of lessons or lesson stages of computer-assisted lessons in the curriculum area 'Mathematics and Science. It is an elective course in several curricular areas (mathematics, science and computer science).

Who teaches the course? - The ability to teach this course

The course was held by three teachers specialized in: computer science, chemistry and physics. The teachers' didactic and pedagogical experience in developing educational software, the participation in numerous national and international conferences on this subject, with presentation of some interesting educational software, approved by the Ministry of Education of Romania, existing in the AEL educational platform, which exists in every school in Romania.

## 2.3. The development of it didactic tools for teaching sciences

Specific competences:

C1 Training and developing the necessary skills in the use of modern ways of communicating and in new information technologies in the context of needing to form a 'digital culture', as part of the minimal baggage of essential skills that students must possess.

C2 The use of specialized software applications for the development of educational software:

FLASH EXPERT SYSTEM

Values and attitudes

- Development of creativity and imagination in solving a problem.
- Channeling efforts in terms of developing the analysis and designing skills required by society.
- Using the expert system to develop useful applications in various fields of computer knowledge combined with those of physics and chemistry.
- Expanding evaluation capacity / self-analysis through teamwork and analysis of piece of work .
- Stimulating creativity, students and team's initiative.
- The diversification of concerns in software services.

## 3. Presentation of development and use of the educational software: "alkanes" and "20,000 leagues under the sea"

### 3.1. "ALKANES" – 7 interactive lessons of organic chemistry

Please acknowledge collaborators or anyone who has helped with the paper at the end of the text.

- What's new in this software? :

3D modeling of organic molecules and chemical processes

The simulation of chemical bonds breaking from REACTANTS and forming new chemical bonds out the products of the reaction;

Developers: MIXED TEAMS of TEACHERS AND STUDENTS;

- Technical Resources

Programming languages used:

- Hyper Text Markup Language (HTML);
- Java Script;
- Virtual Reality Modeling Language (VRML);
- Macromedia Flash Action Script2;
- Applications used in software development: Edit Plus2, Flash MX 2004, Adobe Photoshop 7.0, Hyperchem, Cactvs3
- Using software in teaching-learning-evaluation lessons[3]:
  - you can access all 7 lessons from the main menu:
  - Structure of alkanes and isoalkanes;
  - Halogenation reaction of the alkanes ;
  - Oxidation reaction of alkanes;
  - Breaking of simple covalent Carbon bonding in alkanes;
  - Pyrolysis reaction of alkanes;
  - Isomerization reaction of alkanes;
  - Chemical processing of methane;

Every lesson is accompanied by the diagnosis and the continuous tests, worksheets, real models of alkanes molecules. Each student works both in the laboratory and virtually, on the computer.

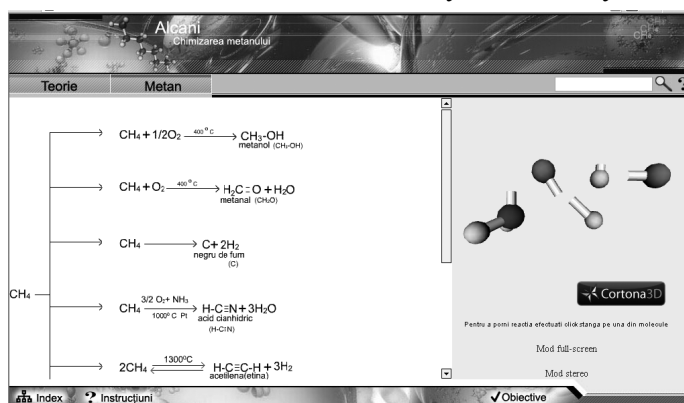


Fig. 1. Chemical processing of methane

- Real aspects regarding the use of virtual lesson stages in teaching-learning-evaluation process.
  - The software, due to its interactivity, reduces the time the student needs to understand physical and chemical phenomena, making the connection between the previously studied physical and chemical phenomena and the physical phenomena that are that accompany the chemical reactions of alkanes: the bond energy, the calculation of bond energy, the calculation of Q given or absorbed during a chemical reaction.
  - The teacher's coursebook is accompanied by a CD containing the educational software t and certain suggestions for conducting the seven interactive lessons from the didactical unit: Alkanes.
  - We present aspects from the interactive lessons: "Methane chemical processing" and "Isomers of Alkanes"

### 3.2. “20,000 leagues under the sea” educational, interdisciplinary software physics-chemistry-biology-Computer Science-world literature.

- General presentation of the software[4],[5],[6];
  - the software serves as a supporting course material for universal literature courses(grades V-VIII),chemistry (grades VIII-IX), physics (grades VI-VIII)
  - the development of students’ creativity and imagination
  - the understanding of physical and chemical phenomena from Jules Verne’s novel “20,000 leagues under the sea”
  - essential rules for correct alimentation
- The planning and development of this educational software highlight the need to achieve the objectives of reference:
  - understanding the specific terms and concepts in physics, chemistry and biochemistry;
  - the development of skills for exploration-investigation of reality and skills for experimenting through use some instruments and procedures in chemistry, physics and biochemistry
  - the development of communicational skills by using physics, chemistry, biochemistry and specific language of universal literature .
  - inculcation of values and attitudes regarding the impact of physics and chemistry on real life;
  - re-updating and reinterpretation in a modern vision of the novel "20,000 Leagues Under the Sea"by Jules Verne;
- There are designed five lessons, each with specific skills and each lesson is also given operational objectives;

The lessons are:

- The presentation of the novel “20.000 Leagues Under the Sea”
- The expedition under the sea (Archimedes’ force)
- Producing electricity from chemical energy (cells, nuclear reactions from an atomic submarine);
- Crew’s menu(biochemistry notions)
- Instruments in the control room of a submarine;

Educational software can be used sequentially, in lesson stages:

Thus, next we will present 3 sequences from the educational software.

Underwater expedition(submarine), electricity production:cells,nuclear reactor; essential elements of biochemistry

- in lesson L2 “The Submarine”- Archimedes’ Principle is shown using the motion simulation of a submarine based on physical principles;
- Following the virtual experiment in which a submarine is sinking at various depths and calculating for each case, the characteristic physical quantities: hydrostatic pressure, weight ( $G$ ),  $F_a$  (Archimedes’ force).

This lesson can be used as an educational tool demonstration using smart boards and AEL laboratories.

Elements of the lesson are:

- The theory regarding Archimedes’ Principle, hydrostatic pressure, speed
- The modeling of the movement of a submarine based on the principles of physics;
- Making virtual experiments on physical determinations for:  $F_a$  (Archimedes force), pressure and speed;
- Data interpretation
- Objectives
- Evaluation to get feed-back

Methodical instructions on how to use the application:

- Select the water volume so that the submarine descends
- Select the water volume so that the submarine ascends
- Compare the values of the buoyant force in both situations

- Compare the values of the hydrostatic pressure in both situations
- Explain how the submarine's buoyant force varies during its movement
- Explain how the submarine's hydrostatic pressure varies during its movement

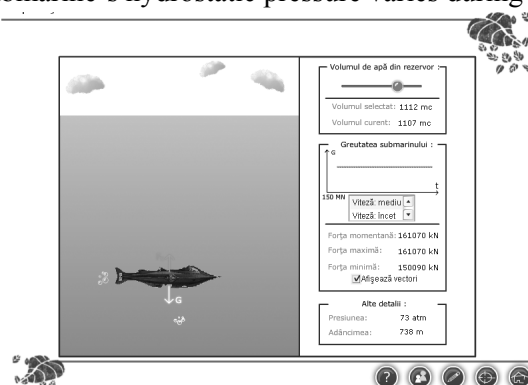


Fig. 2. Submarine expedition

- Methodical suggestions on how to use the educational software:
  - Right after the user opens the novel, he/she is introduced in the science fiction world of Jules Verne. The challenge of this multimedia product is for all students between the sixth and the twelfth grade. The update on the novel which was read by the young user in childhood leads him/her to develop his/her creativity and imagination
  - The teacher-student team can follow the teaching approach increasing the efficiency and the quality of the teaching-learning-evaluation process
  - The underwater expedition stimulates and motivates the student through the interactive teaching approach proposed in the virtual experiment.

In L3 lesson “Fuel cells” there is presented the transformation of the chemical energy into electricity. The lesson contains:

- The theory on the transformation of the chemical energy into electricity
- The theory on redox reactions
- The theory on oxidation and reduction potentials:
  - Daniel-cell modeling and its operation, and the possibility of formatting fuel cell using a different metal electrodes;
  - The objectives of the lesson
  - Evaluation in order to obtain feed-back;

Methodical instructions on how to use this application (“Fuel cells”):

- Select the Movie button and follow the construction of the Daniel-cell in the chemistry laboratory;
- Select the Theory button which presents the scientific knowledge about the construction and the functioning of a cell;
- Select Zn and Cu electrodes for modeling the Daniel-cell in the virtual lab;
- Compare the values obtained for the electrical voltage in both situations (virtual and real lab);
- Select Fe and Cu electrodes for modeling a fuel cell and explain the mode of computing the electrical voltage
- Select one anode and one cathode in order to model the possible fuel cells
- Explain the mode of computing the electrical voltage for the previously modeled fuel cells

In L4 lesson there is presented the “Crew menu” from Jules Verne’s novel. These sequences could be used at all chemistry/ biochemistry classes for sixth grade by teachers in all AEL labs. The elements of this lesson are:

- General concepts of nutrition;
- Types of menus pointed out in the diet of the Captain Nemo’s submarine’s crew;
- Information about ingredients, methods of cooking and nutritional values of the proposed menus;

- The creation of a menu and the computation of its calories;
- The objectives of the lesson;
- Evaluation in order to obtain feed-back.

Methodical instructions on how to use this application:

- Select the Theory button which presents the nutrition rules;
- Select a menu for Captain Nemo so that, at the breakfast, he will eat aliments with the nutritional value equal to 920 calories;
- For the commanded menu, press the I button to inform yourself about the cooking mode
- Select a menu for medium effort;
- Select a menu for intense effort
- Compare the number of required calories for medium effort actions with the one for intense effort actions;

#### 4. References

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