International Conference on Innovative Learning in Chemistry
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Motivation of Bulgarian Students to Study Chemistry: Problems and Solutions
1. Bulgarian School education system: Structure, characteristics, tendencies

According to the way of funding
- State schools
- Municipal schools
- Private schools

According to the level of education offered
- Grade schools:
  - Primary stage
  - Elementary stage
- Secondary schools:
  - high schools
  - profiled high schools
  - vocational schools
  - special schools
  - schools of arts

According to the content of training
- Vocational schools
- Comprehensive schools
- Special schools
Present status of Bulgarian school system

• Total number of schools: 5164
  – Comprehensive – 2166
  – vocational – 477
  – primary schools – 156
Negative tendency 1

- Reduction of schools number
- The reasons
  - Demographic crisis and decreasing number of children;
  - Reformation of Bulgarian education system
Number of Bulgarian schools including secondary ones 2000 - 2012

National statistical Institute data, Eurybase - Bulgaria
Negative tendency 2

- The total number of students in Bulgarian schools decreases;

- The reason: Negative tendencies in Bulgarian political, economical and social development last 20 years.
Total number of students in Bulgarian schools 2000 - 2011

National statistical Institute data, Eurybase - Bulgaria
Negative tendency 3

- **Considerable number** of children dropped out the school system

- **Main reasons:**
  - social status and lack of finances;
  - going abroad;
  - lack of wish (mainly for ethnic minorities);
  - lack of interest and motivation
Number of students, dropped out from the school system (lower and upper secondary schools), 2000-2011

National statistical Institute data, Eurybase - Bulgaria
Major priorities for secondary school education in 2012/2013:

• Considerable decrease of the number of drop-outs providing free transportation, text books and food plus developing a wider scope of extra curricula activities;
• Sustainable school network;
• Improvement of the quality of educational process, modification of syllabi and curricula;
• Improvement of professional qualification of teaching staff - about 43000 teachers are due to pass professional appraisal and qualification courses;
• enforcement of the new Pre-school and School Education Act developed by the Ministry of Education and Science.
2. Main obstacles affecting the students’ motivation to study of Scientific Subjects in schools

- Lack of precise vision and policy concerning the volume and quality of knowledge (theory and practice) at the different education levels;
- Shortage of financing for the educational and scientific institutions for modernization of the material base and for use of modern equipment;
- Lack of synchrony between the ICT-specialists and the teachers in elaboration and implementation of interactive education materials;
- No prospects for professional realization
3. Research activities on students’ motivation to study Chemistry:

3.1. National network set up

• 5 Secondary schools involved:
  – 1 high school in Natural sciences and Mathematics;
  – 1 vocational school in Chemical technologies;
  – 2 vocational high schools of Electrotechnics & Electronics;
  – 1 Mechano-electrotechnical high school.
National network set up ...

- 10 secondary school teachers (2 from each school):
  - Chemistry – 1;
  - Chemistry and Biology – 3;
  - Chemistry and Physics - 3;
  - Chemistry and Environment - 2;
  - English - 1.

- More than 200 students from the involved secondary schools
National network set up ...

• 5 experts:
  – 2 University professors (scientists) - Research Laboratory of Chemistry education & Philosophy of Chemistry - Sofia University
  – 1 University professor (scientists) - Plovdiv University;
  – 1 young researcher (PhD student, chemistry teacher at the same time) - Sofia University
  – 1 Chief expert in Natural sciences and Ecology from Regional Inspectorate of Education (MEYS) – Gabrovo
Distribution of teachers and experts according to the years of experience
3.2. Review of national publications on students motivation to study Chemistry

- national publications on students motivation reviewed and commented:
  - Papers and magazine articles;
  - Websites;
  - Books.
Review of national publications...

• Identified main obstacles to students’ motivation to study Chemistry:
  – Academic style of course book content which is difficult to understand - knowledge should be grounded on and oriented to practical experience;
  – Deprecated material base and insufficient modern equipment - one of the most serious problems related with the study of Chemistry;
  – Lack of specialized literature written in easy to comprehend language;
  – Not enough training courses for teachers related to the interactive methods of teaching Chemistry

The result: No willingness and motivation to study Chemistry
Review of national publications...

- And some more reasons in addition ...
  - Insufficient number of chemistry classes - there is no time for lab exercises;
  - Large classes with no possibility to be divided into groups during lab exercises - no possibilities for normally conducted lab exercises and ensuing progress check;
  - Too large lesson units - students are unable to extract the most relevant information;
  - Students are inadequately capable to cull textual information, read charts, diagrams, graphs and chemical equations

The result: No willingness and motivation to study Chemistry
Identified possible approaches to motivate students to study Chemistry:

- Improvement the organization of the educational process: making explanations easy to understand and support them with practical exercises; involving students in scientific activities at school but also outside school;
- Developing tools and alternative teaching material relying heavily on ICTs to be used by teachers;
- Providing continuous training to Chemistry teachers;
- Development of conditions for self-realization of young people.
4. Review of national ICT-based teaching resources and materials to teach Chemistry

- Type of the reviewed Chemistry teaching resources:
  - Online courses - 5
  - Downloadable software - 4
  - Web sites - 6
  - downloadable materials – 10

- Level of Chemistry knowledge:
  - Basic - 7
  - Medium - 14
  - Advanced – 1

- Level of education:
  - Primary school - 2
  - lower secondary school - 10
  - upper secondary school - 14
National ICT-based teaching resources...

- **Pedagogical approach**
  - Cooperative learning - 7
  - Problem solving - 2
  - Peer education - 3
  - Experimental learning - 4
  - Other (discussion, home schooling, self-education) – 5

- **Subject area:**
  - Life chemistry - 7
  - Environmental sciences - 8
  - Material Science - 1
  - General Chemistry - 12
  - Food science - 4
“www. Ucha.se”

- **Type:** Website ([http://www.ucha.se](http://www.ucha.se)), Online course, Downloadable material
- **Authors:** Darin Madzharov, Maria Nikolova
- **Level of Chemistry Knowledge:** Basic
- **Subject Area:** All subject areas
- **Target group level:** Primary, lower and upper secondary school
- **Pedagogical Approach:** Problem solving, Peer education

The best Bulgarian web-site in category “Education and Science” for 2012
Virtual chemical laboratory

- **Type:** Downloadable software ([http://chemistry.dortikum.net/bg/download/](http://chemistry.dortikum.net/bg/download/))
- **Author:** Boyan Mihaylov
- **Level of Chemistry Knowledge:** Basic
- **Subject Area:** General Chemistry
- **Target group level:** lower secondary school
- **Pedagogical Approach:** Experimental learning
- **Pedagogical Value:** students acquire basic knowledge about working in a chemical laboratory without the risk of potential accidents
Supporting tools: periodic table, the solubility table, the oxidizing and relative activity table and even a glossary. Virtual worktable. Operation guide (explanations). Chemical equation (animation, video). Chemical substances (metals, oxides, acids etc.). Lab equipment.
5. Workshop on students’ motivation to study Chemistry

• Participants:
  – Secondary school Chemistry teachers;
  – representatives of universities and organizations involved in the national network as experts;

• Discussed problems:
  – Motivation: how to achieve it
  – Students’ motivation to study Chemistry – problems and solutions;
  – use of interactive materials in the process of teaching as a tool to stimulate students’ interest and increase their motivation to study Chemistry;

• Basis for the discussions:
  – publications on students’ motivation and interactive teaching materials on Chemistry available on the CIAAN Project portal
Results from the workshop:

• Identified the main reasons for the lack of students motivation to study Chemistry:
  – Material is theorized;
  – Lessons are monotonous and uninteresting;
  – Knowledge is not practical and useful;
  – Lack of understanding of the material and hence difficulty in learning it;
  – Lack of laboratory facilities and possibilities for the visualization of processes, etc.
Results from the workshop…

- Defined possible ways to increase students' motivation
  - provoking students' interest by using more user-friendly and interesting materials;
  - more interesting and effective presentation of the material via multimedia lessons, games and exercises;
  - teaching to become a positive emotion for students;
  - Illustrate the material to its practical realization through industrial tours and visits to companies;
  - A change in the teaching approach designed to encourage practical work on the problems of motivation, project work and networking.
Results from the workshop...

• Offered suitable for school teaching interactive materials, based on the following criteria:
  – To be developed in a simple scientific language;
  – To not hinder students in using them;
  – To allow independent teamwork;
  – To enrich the theoretical knowledge and practical skills of the students.

• Examples:
  – ArgusLab
  – Chemoffice,
  – 50 Really Cool Online Tools for Science Teachers
  – A Química das coisas etc.
Conclusions

• Negative tendency of Bulgarian school education nowadays is the lack of interest among students to study Chemistry.
• Possible approaches to improve the teaching-learning process and to motivate students could be:
  – Improvement the organization of the educational process;
  – Developing tools and alternative teaching material relying heavily on ICT to be used by teachers;
  – Providing continuous training to chemistry teachers
  – Development of conditions for self-realization of young people
• Effective tool for the practical implementation of these approaches can be ICTs based products that allow linking the skills and interests of today's web – generation to Chemistry curriculum, updated with the achievements of science in this area.
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