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CHEMISTRY EDUCATION IN ITALY: FOCUS ON ICT RESOURCES TO ENHANCE STUDENTS' MOTIVATION

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Abstract

In Italy, among the scientific fields, chemistry is identified as an exemplary case study as it is recognised as one of the most difficult subjects. In order to enhance chemistry education, a key objective, is to motivate students, to raise their interest in science subjects, thus making their learning process more effective. For this purpose, the Government has taken a number of actions, with particular attention to the use of information technologies as educational tool for the new generations, those of 'digital natives'. The paper presents the first step of a research aiming at evaluating the utility of carefully selected ICT teaching resources on chemistry learning and students' motivation

STUDENTS' MOTIVATION FOR CHEMISTRY

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(No Abstract given)

1. European observations

The youths' disaffection for science in general and for chemistry in particular is widespread in Europe. The situation is sometimes catastrophic: in Belgium at the UCL, 120 students graduated in chemistry in 1972 (called "licences" at the time); nowadays, there are only a dozen of them a year.
Everywhere, from Bulgaria to Spain, the same arguments come up; they can be divided in two categories:

Society-related arguments.
Subject-related arguments.

2. Personal observations

There is nothing new here and all the initiatives taken do not seem to really change anything:

- the creation of promotion units for university science (such as Scienceinfuse at UCL *http://www.uclouvain.be/scienceinfuse.html*),
- science promotion activities organised by French-speaking universities for schools and the general public such as "le Printemps des sciences" (*http://www.sciences.be/*),
- the publication of a second edition of the book "ChemCom, Chemistry in the Community" USA, although it is from 1995,
- the commendable efforts to restore the image of chemistry and encourage the youths to study it made by industries (such as Essenscia and many others, Agfa Gevaert DIDAC….) …

So, what should be done?

3. New ideas for remediation

More experiments in the class, specific preparation for studies, ICT associated with systemic approaches…

- **Analysis of the sources of (de)motivation in the school context**

Rolland Viau proposes a list of practical advice to motivate students. If we try to put those recommendations in the context of a chemistry course, specificities appear

1. **The teacher must take care not to harm students' motivation.**

2. **The teacher has to improve one or several aspects of their teaching to increase students' motivation.**

- **ICT and systemic approach to chemistry**

Conclusion:

Chemistry is a particularly complex science, in which beginners need support from an expert in order to:
1. master the scientific jargon
2. master it through experiments
3. master it through the use of ICT

SETTING UP A SCIENTIFIC SCHOOL PROJECT AS A METHOD OF INCREASING STUDENTS' MOTIVATION FOR STUDYING NATURAL SCIENCES AND ECOLOGY (DTTO POSTER)

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Abstract

The paper reports the experiment of a team from the National Aprilov High School to increase the motivation of students interested mainly in the humanities for the natural science subjects through the development of a school project.

The aim of the project entitled "Science from Granny's Chest Drawers" is to build a bridge between present days' science and technology and the history of Bulgarian crafts of the mid and the late 19th century. The old technology of braiding and dyeing woolen threads is interpreted attractively and unconventionally on modern scientific level. The project activities include the use of the authentic "chark" equipment for braiding woolen threads. It has been restored to the way it looked in the 19th century when it was used. Woolen threads are coloured with natural dyes obtained from plants and herbs gathered by the project participants. A small model of the wool-braiding workshop shows how the equipment works driven by the mechanical force of water.

HOW CZECH INTITUTIONS OVERCOME THE LACK OF STUDENT'S MOTIVATION TO LEARN CHEMISTRY

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Abstract

The paper focuses the issue of Czech pupils` and students` motivation to study chemistry. Various sources of this lack are reported and analyzed, from technical equipment and teaching methods to general opinion and unpopularity of chemistry. Possible ways to improve this state-of-the art are suggested, e.g. usage of new educational methods, electronic tools and ICT-based learning/teaching materials. However, this is limited by costs of new tools and time and effort necessary for change. Students` motivation can be increased also by popularization events as Lessons of modern chemistry, Chemistry fairs etc.

GREEK TEACHERS' AND SCIENTIFIC EXPERTS' PERCEPTIONS OF STUDENT MOTIVATION TO LEARN CHEMISTRY

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Abstract

This study investigated scientific experts' and teachers' perceptions of student motivation to learn chemistry. The participants were 5 researchers from 5 different Institutions and 11 teachers (3 in primary and 8 in secondary education) from 9 schools in Greece. Data were collected via workshop activities which aimed at addressing the participants' perceptions regarding a) supportive teaching resources b) students' general motivation and c) motivating practices. Qualitative data were analyzed by the constant comparative method. Five motivational constructs and three motivational factors related to chemistry learning were drawn from the participants' comments. Namely the identified motivational constructs were the following: i) interest, ii) self-regulation, iii) self-efficacy, iv) teachers' expectations on student performance, and v) extrinsic motivation. The three identified motivation factors were i) the curriculum design, ii) the teacher and iii) students' family. Implications for educational policy and classroom practice are discussed.

MOTIVATING STUDENTS TO STUDY CHEMISTRY: SOME IRISH INITIATIVES

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Abstract

In recent years, several initiatives have been taken to motivate more students to study Science in general and Chemistry in particular. Industrial and governmental bodies have spoken repeatedly about the need for skill-building in the Science Technology Engineering and Mathematics (STEM) subjects, including Chemistry, that are seen as vital in underpinning the Knowledge Economy and aiding Ireland's recovery from economic downturn.

Uptake of Chemistry as a subject for the terminal examination at second level in Ireland, the Leaving Certificate, has seen a slight increase to over fourteen per cent. However, this turnaround could be difficult to maintain due to a number of factors, not least the fiscal situation and its effect on school budgets for more expensive practical subjects, as well as allocation of subjects to students within timetabling constraints and choice by students of the science and technology subjects. The latter is further influenced by attitudes to, experiences of and perceived usefulness of Chemistry, both by students and their guardians. Teachers and school facilities have a central role to play in student motivation. A proposed new curriculum for second level Chemistry, with a more emphatic requirement for practical work, is currently in the post-consultation phase, and a new Chief Examiner for Chemistry at upper secondary level has recently been appointed.

This paper will present a review of the current status in Ireland for motivating more students to study Chemistry, and more teachers to keep apace of the changes in Chemical Education and Information and Communication Technologies which have become best practice internationally.

SPANISH STUDENTS MOTIVATION ON SCIENCES.

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Abstract

In this paper, we are going to make a review of the decreasing number of science students and their negative attitude towards science subjects like Chemistry, and we show some solutions proposed by some Science Education authors and experts. Some of the most evident solutions ask for deep changes in Science curricula and in teaching methodology to achieve a contextual and co-operative science. These solutions include the use of daily Chemistry and ICTs resources in our schools.

'HOW TO MAKE YOUR STUDENTS FEEL CHEMISTRY WITH CHEMISTRY?'
A FEW WORDS ABOUT MOTIVATING YOUNG PEOPLE TO LEARN SCIENTIFIC SUBJECTS MORE EFFICIENTLY

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Abstract
Contemporary schooling in Poland faces many obstacles with regards to teaching scientific subjects. Despite undergoing a few educational reforms Polish students are still quite reluctant to study subjects like Chemistry and Physics and object to learning anything more than the required minimum. The majority of young people find science difficult, boring and useless – young people clearly call chemistry, biology and physics their least favourite subjects, and they do not have any motivation to explore them further. Within this, teachers struggle in the classroom trying to work both in compatibility with the core curriculum requirements, which after the reforms contains a reduced number of chemistry lessons in all the educational stages, and with the agreement with their own consciousness. Schools are poorly financed and chemistry or physics laboratories badly equipped. Many of teachers are forced to change their teaching and adapt it to the existing situation i.e. poor infrastructure, students' little expectations and changes in the curriculum. Motivating students is not an easy task but undoubtedly worth trying as there is not a better feeling for the teacher as seeing a young person fully content and satisfied, involved in a scientific task. Teacher's role today focuses not only on teaching but also on opening students eyes to the world around them, on making them sensitive to critical scientific issues. He or she should be aware of a few tricks how to make science more digestible and student-friendly to a young, curious mind.

STUDENT'S MOTIVATION TO STUDY CHEMISTRY: SOME INSIGHTS INTO THE PORTUGUESE CASE

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Abstract

Chemistry is universally assumed as one of the most difficult and demanding science subjects. It is recognized as involving difficult concepts, specialized terminology and mathematics. Moreover, some chemistry curricula are considered quite apart from students' interests, every-day life contexts and technological issues. Context-based chemical education has then emerged as a valuable strategy worldwide being presently also followed in the Portuguese educational system. Nevertheless this aspect, chemistry is nowadays facing several constraints in the Portuguese context, particularly in the 12th grade, namely by the reduction of the total teaching time; the fact of becoming an elective course, and the reduction of the teaching time devoted to experimental activities. With the present work we intend to give an overview of the Portuguese situation concerning student's motivation to study chemistry addressing the following points: (1) Chemistry in the Portuguese educational context, (2) Analysis of national reports/initiatives; and (3) Analysis of the Chemistry is all around Portuguese teachers' opinion. Concerning this last point, one important issue is the generalized acceptation that a motivated and well prepared teacher is the key for the success. The implementation and use of ICT-based resources in schools is seen as a powerful auxiliary tool to teach and learn science. Nevertheless, the chosen ICT-based resources must be centered on the student, motivating an autonomous thinking/learning process. Teaching resources could not be seen as a teacher substitute. It is generally accepted by the Portuguese involved teachers that students like and privilege the direct contact with the teacher.

STUDENT MOTIVATION IN TEACHING CHEMISTRY IN SLOVAKIA

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Abstract

This paper deals with the importance of interests in student learning motivation. It investigates the level of interest in chemistry for the high school students and its relations to the evaluation of chemistry and various aspects in teaching chemistry.
***Key words**: learning motivation, chemistry, interest*

THE OPINIONS OF PROSPECTIVE SCIENCE TEACHERS TOWARDS THE EFFECIENCY OF CONSTRUCTIVIST APPROACH CENTERED SCIENCE LABORATORY PRACTICES ON STUDENT MOTIVATION

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Abstract

Laboratory practices are very important to ensure students' motivation to subjects related to science. The purpose of this study is to identify the opinions of prospective science teachers towards the effeciency of constructivist approach centered science laboratory practices on student motivation. Case study model which is one of the qualitative research models is used for the research. 60 prospective science teachers which are determined through criterion sampling method were interviewed and the data were analysed by using the content analysis. Suggestions towards increasing students' motivation to science subjects were made according to the result of the study.

THE CONCEPTUAL PERCEPTIONS OF CLASROOM TEACHER TRAINEES ABOUT THE BOILING SUBJECT

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Abstract

The purpose of this study is to identify the conceptual perceptions of prospective classroom teachers towards boiling subject. Case study model which is one of the qualitative research models is used for the research. The study group was determined by the criterion sampling method. The sample of the study is comprised of 153 prospective classroom teachers. A semi-structured instrument was used for gathering the data. The data were analyzed by using the content analysis. Suggestions were made according to the result of the study.

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CHEMISTRY OLYMPIAD − MERE COMPETITION OR EDUCATIONAL TOOL?

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Abstract

ICT Prague is one of the leading scientific institutions in the field of chemistry in the Czech Republic. To sustain the high level of studying programs and research it is necessary to attract potentially good students. From this reason ICT Prague run a plenty of activities for secondary school students.
One of the most important activities is Chemistry Olympiad (ChO). ChO is the second oldest subject competition for secondary school students in Czech Republic. In 2012 it is organized already 49th year of the competition. The competition tasks are prepared in four categories for "gymnasium" type secondary schools according to the age of students (A to D) and one category for secondary technical schools with focus on chemistry (E).
The participants start with solving theoretical and practical tasks of the school round. The control test follows to finish the basic level of the competition. The best students are invited to district (for the lowest category D) or regional round (other categories). The nationwide round is organized only for the highest categories A and E as a four days social event.
Quite soon after the start of the national competition in sixties the idea of International Chemistry Olympiad (IChO) was born. Thus in spring 1968 the first IChO was held in Prague and only three countries had participated: former Czechoslovakia, Poland and Hungary. From the beginning mainly countries of eastern block had participated, after the fall of the Soviet Union the competition became really international. Nowadays it is prestigious and great event with participation of about 400 persons from nearly 70 countries.
Both national and international olympiads represent the effective tool for finding and education of gifted pupils and students. These competitions give them opportunity to develop their abilities, to study successfully at university and later to start their scientific carrier.

SUMMER CAMP BESTVINA − EXAMPLE OF GOOD PRACTICE IN NON-FORMAL EDUCATION (POSTER)

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Abstract

The scientific camps in Czech Republic have a long-term and fruitful tradition. They combine high-level educational process with the social program and sport and outdoor activities. The main event is organized more than 30 years for the best participants of Chemistry and Biology Olympiads. Main thought is to help enthusiastic students with studying chemistry and biology, prepare them for next year Olympiad and get into contact with university teachers. They are not getting only chemistry and biology knowledge but there are many interesting interdisciplinary lectures given by famous scientific speakers.

Students have to attend morning and afternoon lectures. There are 3 hours' blocks, theoretical and practical, covering main disciplines of chemistry (inorganic, organic etc.). The team leaders and lecturers are mainly university students, former participants of the summer camp and teachers and scientists from universities and Academy of Sciences. Thus the advantage is that they will meet people from science and it is much easier to start working on scientific projects.

The participants are selected according to their results in regional rounds of ChO so they come from all over the country. Camp base Bestvina is suitably located approximately in the middle of country so it is easy both for participants and lecturers to get there. The capacity is sufficient – up to 120 students and 30 lecturers. It is a nice place surrounded by pond and forest and equipped with many playgrounds offering sport activities. The free time sport, outdoor and social activities are inseparable part of the event and make it so popular among students.

PROJECT: SUPPORT FOR TECHNOLOGY AND SCIENCE FIELDS

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Abstract

A broad-range popularization project aimed at introducing a system of marketing support for technology and science fields of study at universities and other institutions of higher learning. Project activities are divided into three major pillars: motivation activities, science communication and teaching support, and they are both directly and indirectly aimed at the target group of potential applicants for study.

The project outcomes are among other things the methodologies of support for technology and science education, marketing materials, analyses and case studies. They were presented by way of conferences, seminars, workshops, popularization lectures, and particularly by way of pilot motivation activities in all regions of Czech Republic.

This project is co-financed by the European Social Fund and the state budget of the Czech Republic.

MASARYK SECONDARY SCHOOL ACTIVITIES AIMED TO SUPPORT OF TEACHING CHEMISTRY AT PRIMARY SCHOOLS

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Abstract

Motivation of pupils for studying chemistry is important part of chemistry teaching. This process has to start at the primary school and it is necessary support primary schools teachers. This paper describes Masaryk Secondary School activities aimed at support of teaching chemistry at primary schools.

WHAT MAKES SOME EDUCATIONAL RESOURCES MORE USEFUL FOR DIFFERENT CULTURAL AND LINGUISTIC CONTEXTS?

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Abstract

*How can teachers, publishers or repository owners recognize content that truly lives up to the promise of Open Educational Resources' (OERs) re-usability, flexibility and quality? What makes some educational resources more useful for different cultural and linguistic contexts? This question has been raised in eQNet, a three-year (September 2009-2012) project coordinated by European Schoolnet and involving nine Ministries of Education that was funded under the European Commission's Lifelong Learning Programme. After three years of reflection, dialogue and systematic testing by teachers in different countries, eQNet has published a set of **'Travel Well' criteria**. The term 'travel well' as applied to learning resources as a convenient shorthand to describe content that can be used by teachers in different countries. Any teacher, repository owner, publisher and vendor can now use the 'Travel Well' criteria described below to identify quality digital learning content with a high potential for re-use.*

NANOWORLD COMES TO SECONDARY SCHOOLS IN THE CZECH REPUBLIC

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Abstract

The so called nanoworld is a very interesting domain of research that has a lot of applications useful in common life. For example, antibacterial socks with silver nanoparticles, high-capacity hard discs based on the giant magnetoresistance or clothes with nanofibres are recently easily available "nanoproducts". Due to the great importance of "nano", some basics from the nanoworld should be implemented into the science curriculum at secondary schools. Therefore, we have designed various educational materials (such as an educational text, a multimedia presentation, an excursion concept, a concept of a project, worksheets with tasks, tests and interdisciplinary "nanodemonstrations" that could facilitate teaching (and learning) about the nanoworld.

MULTIMEDIA TOOL SUPPORTING THE TEACHING OF LABORATORY EXERCISES OF INORGANIC CHEMISTRY

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Abstract

This presentation will be focused on the multimedia tool made for new university students in the field of chemistry. Each of the parts was originally developed like a helping tool for the students of Faculty of Chemistry in Brno University of Technology, anyway it should be possible to use it for the other schools with similar scope of interest as well. The package of helping tools is focused on very current problem connected with the transition between high school and university, when most of student of high schools (except that ones chemistry specialized) are not in contact with laboratory experience. This tool tries to fill this gap and provide illustrative view about laboratory environment and everything what includes work there. Main topic of the presentation will be the preview of the tool for the laboratory exercises of inorganic chemistry, which belongs to the first laboratory experience on our faculty. This work was developed like a result of the project ChemLearning. The authors of this presentation can see the innovative approach in this project in the fact, that it provides to students of faculty, who have passed the subject, the possibility to create learning tools for future students under supervision of the teachers of this subject. So the students are able to bring and develop unconventional approaches and points of view to the solution of the task and create a unique tool for the others. At the end of the presentation there will be presented the project ChemLearning, Multimedia center - "Pracoviště multimediální podpory", that provided technical support and the project IngLearnig, that focuses on the help to students of master degree.

OPEN SCIENCE - PROMOTION OF RESEARCH AND DEVELOPMENT

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Abstract

The educational project with the title of Open Science opens access for students to scientific and research workplaces via student internship, lifelong learning courses for the secondary school teachers allow bring the latest knowledge and scientific results to the schools, the science communication courses for the researchers learn how to communicate the outcomes of their scientific work and develop the art of presenting their ideas not only in the scientific community but also towards the media.

STEP - STEP TOWARDS THE POPULARIZATION OF RESEARCH AND TECHNOLOGY (POSTER)

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Abstract

One of the main objectives of the project STEP is to popularize science, research and development and their results. It aims at those who are interested in Research and Development (R & D) and students' motivation to study technical and natural sciences on elementary and secondary level, and subsequently interested in work in the field of R&D. Project STEP wants to communicate science and technology in understandable way to the target groups and develop cooperation among elementary and secondary schools across the Czech Republic.
Project STEP consists from nine key activities, described below. These activities can be summarized as follows:
A) Activities aimed at popularizing research and development and its benefit to the society (KA2, KA5, and KA9)
B) Support for systematic work with students in the area of introduction to the area of research and development (KA1, KA3, KA4, KA6, and KA8) and
C) Optional activity-service training in the field of research and development, popularization and communication and dissemination of research results into practice (KA7).
Projects´ objectives are achieved by allowing the audience to look at R&D in an attractive way, entertaining but still highly effective. Effective tools to increase interest in R&D are to enable the target group to obtain practical experience from working in the R&D fields and to experience elements of scientific (laboratory) work.

At the same time it is necessary to motivate scientists to popularize research and train them in the communication and popularization skills that are necessary for improving their communication with both the public and media.
One of the main goals is to attract/motivate talented candidates to study technical and science high schools, which we intend to achieve through the deepening of contacts with primary school pupils and secondary school students who are interested in R&D work during our popularization events.

OUTDOOR EDUCATIONAL ACTIVITIES FOR CHEMISTRY (POSTER)

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Abstract

One of the less known, but very attractive form of educational work in which you can use a number of activating methods in connection with information technology resources are complex science excursions or field trips. Unusual combination of chemical education with outdoor activities in connection with the use of mobile electronic devices – such as GPS navigation, smart phones, videos, tablets etc., sets possibilities which aim to improve pupils' motivation as well as the whole effectiveness of science education.

For practical application and usability of complex chemical excursions is necessary to identify suitable outdoor locations. In this regard we have proved a very particular type of regional field trips according to the natural trails to which we have prepared a variety of materials and electronic documents. We also created worksheets for pupils, where the solution requires the use of electronics and didactic technique [1]. Nature trails allow you to gain information, to recognize interactions in nature or moments in the historical development of the country. For students they mean direct contact with nature. They may become an attractive place for science education with an emphasis on chemistry and offer a new dimension to science observation. The paper presents selected materials and electronic documentation of successfully realized excursions along the nature trails with a chemical focus. To identify the interest of teachers in this form of educational work and usability of our materials we have carried out a questionnaire survey among science teachers from secondary schools in 2006 and 2010 to 2011 [2]. We also evaluated used equipment, learning materials and modern technique for excursions and the best ideas, materials and methodology for chemical focused outdoor activities.

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