

7.2 Annex 1 – Prague Conference Report

International Conference on Innovative Learning in Chemistry

Second conference on the thematic area

Students' Motivation



Prague (Czech Republic)

5 December 2012

Introduction

The International conference on Innovative Learning in Chemistry took place in Prague on 5 December 2012. The aim of the conference was to resolve the problematic of chemistry education and students' motivation towards the study of chemistry and to present the results of national reports on students' motivation.

Conference Organisation

The conference was held in National Technical Library Prague, (Address: Technická 6, Praha 6) on 5 December 2012. The conference languages were English and Czech. Simultaneous translation from Czech to English and vice versa was provided in order to welcome more Czech teachers with lower knowledge of English.

The programme of the conference is available from: <http://icil.vscht.cz/?q=node/4&language=en> and as an annex to this document.

The conference was held from 9 a.m. to 4 p.m. Poster sessions were organized as well to present more projects. During the coffee breaks, the participants had the opportunity to see the posters and discuss their content with the authors.

Conference Participants

66 participants from 11 countries were registered. Besides the project partners, the conference was visited mainly by primary and secondary school teachers, scientific experts and other scientists from universities and academy of sciences. The complete list of participants is available as an annex to this document.

Conference Contents

The conference comprised 19 lectures and 4 posters. Every partner of CIAAN project presented usually one paper - reports on the national situation on Students' Motivation; Turkish partner presented two papers.

All presented papers (usually full texts) are included in the printed conference proceedings which were sent to project coordinator. More copies are available on request from the conference organizers.

Antonio Jesús Torres Gil, from Colegio Santo Tomás de Villanueva, CECE, Granada, Spain, presented a paper entitled "*Spanish Students Motivation on Sciences*", a review of the decreasing number of science students and their negative attitude towards science subjects like Chemistry. They 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.

Marie Walsh, from Limerick Institute of Technology, Ireland, presented a paper titled "*Motivating Students to Study Chemistry: Some Irish Initiatives*" which presents a review of the current status in Ireland for motivating more students to study Chemistry, and more teachers to keep pace of the changes in Chemical Education and Information and Communication Technologies which have become best practice internationally. 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.

Laura Ricco, from University of Genoa, Italy, presented a paper entitled *“Chemistry Education in Italy: Focus on ICT Resources to Enhance Students’ Motivation”*. 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.

Julien Keutgen, from Inforef, Belgium, presented a paper written by **M. De Kesel, B. Tinant and J.-L. Pieczynski**, entitled *“Students’ Motivation for Chemistry”*. The youths’ disaffection for science in general and for chemistry in particular is widespread in Europe. The arguments can be divided in two categories: society-related arguments and subject-related arguments. Personal observations of the authors are also reported. New ideas for remediation are presented. The authors put emphasis on ICT and systemic approach to chemistry. They conclude that 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.

Milena Koleva, from Technical University of Gabrovo, Bulgaria, presented a paper written by **Maria Nikolova**, entitled *“Setting up a Scientific School Project as a Method of Increasing Students’ Motivation for Studying Natural Sciences and Ecology”*. 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.

Zdeněk Hrdlička, from Institute Of Chemical Technology Prague, Czech Republic, presented a paper entitled *“How Czech Institutions Overcome the Lack of Student’s Motivation to Learn Chemistry”*. 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.

Dionysios Koulougliotis, from Technological Educational Institute of Ionian Islands, Zakynthos, Greece, presented a paper entitled *“Greek Teachers' and Scientific Experts' Perceptions of Student Motivation to Learn Chemistry”*. 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.

Magdalena Gałaj, from WSINF, Łódź, Poland, presented a paper entitled *“How to Make Your Students Feel Chemistry with Chemistry? A Few Words about Motivating Young People to Learn Scientific Subjects More Efficiently”*. 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.

Filomena Barreiro, from Instituto Politécnico de Braganca, Portugal, presented a paper entitled *“Student's Motivation to Study Chemistry: Some Insights into the Portuguese Case”*. 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 acceptance 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.

Juraj Dúbrava, from TRANSFER Slovakia, presented a paper of **Milan Veselský**, entitled “*Student Motivation in Teaching Chemistry in Slovakia*”. The 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.

Elif Tuğçe Karaca, from Kirikkale University, Turkey, presented 2 papers. The first of them was written by **M. Demirbaş, H. Çelik** and **M. Bayrakci** and entitled “*The Opinions of Prospective Science Teachers towards the Efficiency of Constructivist Approach Centered Science Laboratory Practices on Student Motivation*”. 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 efficiency 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 second paper of **Elif Tuğçe Karaca** was entitled “*The Conceptual Perceptions of Classroom Teacher Trainees about the 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 analysed by using the content analysis. Suggestions were made according to the result of the study.

Besides the project partners, some more lectures concerning the issue of students’ motivation were presented. **Petr Holzhauser**, from Institute Of Chemical Technology Prague, Czech Republic, presented a paper entitled “*Chemistry Olympiad - Mere Competition or Educational Tool?*”. 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). Brief history and basic features of ChO are presented. 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.

Jitka Svatošová, from Ministry of Education, Youth and Sports, Prague, Czech Republic, presented a paper entitled “*Project: Support for Technology and Science Fields*”. 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.

Jiří Zajíček, from Masaryk Secondary School of Chemistry, Prague, Czech Republic, presented a paper entitled *“Masaryk Secondary School Activities Aimed to Support of Teaching Chemistry at Primary Schools”*. 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.

Barbora Grečnerová, from NAEP, Czech Republic, presented a paper entitled *“What makes some educational resources more useful for different cultural and linguistic contexts?”* 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.

Zdeňka Hájková, from Charles University in Prague, Czech Republic. presented a paper entitled *“Nanoworld Comes To Secondary Schools In The Czech Republic”*. 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, the authors 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.

Jiří Marek and **Martin Kalina**, from Brno University of Technology Brno, Czech Republic, presented a paper entitled *“Multimedia tool supporting the teaching of laboratory exercises of inorganic chemistry”*. This presentation was 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 work was developed like a result of the project ChemLearning.

The most papers attempted to describe the current state of the art as far as the students' motivation is concerned. It can be concluded that the problems with students' motivation in different European countries are very similar, rising from general unpopularity of chemistry, obsolete pedagogical methods and lack of equipment and time allocated to chemistry. Some papers also tried to find the way how to improve students' motivation, suggesting new pedagogical approaches, either ICT-based or not. Some papers reported about successful innovative teaching and learning methods.

Conference Evaluation

At the end of the conference the participants have been asked to fill in an evaluation questionnaire. The areas covered by the questionnaire were: general impression of the conference, usefulness of the conference content, conference organization; the participants were asked if the topics were interesting for them. The conference received a very good evaluation and the participants also made the following statements:

- *The organization of the conference was perfect!*
- *The moderator was great! The interpreting must have been really difficult – I appreciate!*
- *There should be more time for discussion. It should follow each presentation.*
- *Czech teachers would appreciate more examples of successful teaching methods instead of theoretical papers with national overview. They prefer to hear some hints about specific topics which can be labelled as “life examples”, e.g. food analysis, drug manufacture or environment. They want to know some simple motivation experiments where available and approved chemicals are to be used only. Practical demonstration is also desirable for them.*

Conclusions

The conference was an important event to present actual pedagogic issues. Problems with students' motivation to learn chemistry and other science subjects were highlighted. Future perspectives to increase attractiveness and effectiveness of chemistry teaching were also focused.

Although the conference lasted one day, it was rich of content and well appreciated by the participants. School teachers, scientific experts, academic researchers and policy makers had an opportunity to share their results and exchange their opinions.