

7.1 – Annex 1 Florence Conference Report

New Perspectives in Science Education

First Conference on the thematic area

Students' Motivation



Florence (Italy)

7 – 8 March 2012

Introduction

The international conference “New Perspective in Science Education” took place in Florence on 7 – 8 March 2012. The aim of the conference was to present the current state of art and foreseen future perspectives for enhancing attractiveness and effectiveness of chemistry teaching at school, focusing on students’ motivation.

Conference Organisation

The Conference dealt with 6 thematic areas and was organized into 2 parallel sessions.

Some of the experts attending this Conference presented the outcomes/results of their research on a poster. Therefore, in addition to the parallel sessions, 4 poster presentations were organised. During the poster presentation sessions, the participants had the opportunity to examine the posters presented and to discuss their contents with authors. The conference programme is available both on the conference web site (<http://www.pixel-online.net/science/programme.php>) and as annex to this document.

Additionally, in order to give those who were not able to physically attend the conference the opportunity to present their papers, a Virtual Presentation area was created in the conference web site. Conference participants had the possibility to comment on and ask questions about the virtual presentations using the dialogue box under each of the Virtual Presentations. The presentations are available online at http://www.pixel-online.net/science/virtual_presentations.php.

Conference Participants

Almost 100 participants registered from 30 countries from around the world. More than 70 institutions participated representing universities, schools, educational companies and public authorities. The complete list of participants is available both on the conference web site (<http://www.pixel-online.net/science/speakers.php>) and as an annex to this document.

Conference Contents

During the conference, 85 papers have been presented. As described in the previous paragraph the papers were organised in the following 6 thematic areas:

- Enhancing Students’ Motivation
- New Technologies for Science Teaching
- Science Education Projects and Initiatives
- Science Teaching Methods
- Studies on Science Education
- Training of Science Teachers

All presented papers are included in the conference proceedings which are available online on the Conference website (<http://www.pixel-online.net/science/conferenceproceedings.php>), on CD-Rom distributed to conference participants. Additionally, all papers have been published in a book by the Italian publisher Simonelli. The CD Rom and the book are available as annex to this document.



Many papers were directly included in the thematic area “Enhancing Students’ Motivation”, but it has to be mentioned that the papers presented in the other thematic areas contained many elements, suggestions and reflections related to the issue of the students’ motivation.

Milena Koleva, from the Technical University of Gabrovo (Bulgaria), presented a paper entitled “*Evaluation of Students’ Opinion for Enhancing Their Motivation in Learning Chemistry at Technical Universities*”. The paper states that chemistry is an unintelligible and sophisticated science for students at the technical universities and therefore there is an urgent need to make the discipline attractive for the learners. Students are seen as a specific learning target group. An enquiry among students from technical university is held in order to evaluate their opinion/satisfaction with a training course in chemistry. The enquiry includes important quality criteria of the course such as quality of the teaching material, lecturers qualification, using attractive technical tools, modern teaching methods, access to additional resources, assessment methods. The used methodology gives qualitative and quantitative evaluation of the chosen criteria. The results are used to make conclusions for improving the teaching course beginning with quality criteria with the biggest importance. They also give indications for improving of the teaching methods and the used learning technologies in order to increase the quality and attractiveness of chemistry and students’ motivation for learning chemistry.

Milena Koleva, together with **Lilyana Nacheva-Skopalik**, also presented: “*Making Chemistry an Attractive Subject for Lifelong Learning: Interactive Approach in Presenting Educational Content*”. The paper presents an analysis of results from evaluation of the interactive ICT – based educational packages elaborated during the LLP Project Chemistry Is All Around Us. The analysis was based on the opinion of two groups: Bulgarian secondary school teachers and adult learners. The educational materials have been highly evaluated as a good manner to attract the interest of the learners. Both the two participants in the Chemistry education process – school teachers and learners - consider the interactive approach in presenting chemical knowledge using ICT – based education and training materials an efficient way to enhances the students’ interest and to stimulate the active learning process concerning Chemistry. The evaluated pilot education packages give well illustrated, useful and written in understandable way information about how Chemistry influences our everyday life. They help students to build scientific logical thinking and offer in simple way a good possibility for training in Chemistry and for practical application of the knowledge.

Dionysios Koulougliotis, from Technological Educational Institute (TEI) of Ionian Islands (Greece), presented a paper entitled “*Students’ Motivation to Learn Chemistry: The Greek Case*”. On the base of the existing literature and focusing on research findings that are relevant to the Greek student population, the authors define three main categories that can positively influence the attitude towards chemistry: teaching approaches, educational tools, and non-formal educational material and activities. In addition, recent studies related to probing Greek students’ attitudes toward chemistry, indicate a low level of student motivation to engage in chemistry learning, a fact which could be related to the following issues: difficulty of the chemistry course, demanding curriculum in combination with little allocated teaching time, use of unattractive teaching methods, and lack of career opportunities.

Marie Walsh, from Limerick Institute of Technology (Ireland), presented a paper entitled “*Current and Future Methodologies for Improving Teacher and Student Experiences of Chemistry in Schools: an Irish Perspective*”. The author describes the dramatic decrease in participation in Chemistry after the compulsory level is reached by the students. Factors that influence this include provision of the subject in schools, allocation of subjects to students within timetabling constraints and choice by students of the science and technology subjects. Choice of subjects is further influenced by attitudes to, experiences of and perceived usefulness of Chemistry, both by students and their guardians. The presentation focused also on the several initiatives set up in order to tackle the issue and their little impact.



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Paolo Piccardo and Marilena Carnasciali, from University of Genoa (Italy), presented a paper entitled “*X_Science: Communicating Science through Cinema and Science Fiction*”. The authors pointed out how Science and scientists are often considered too far from common people and too hard to be understood. “*X_Science: Cinema between Science and Science Fiction*” is an event, organized by the Faculty of Mathematical, Physical and Natural Sciences of the University of Genoa, together with the GenovaFilmFestival and funded by the Liguria Region Governance. Its aim is to try to fill the gap between scientists and common people by encouraging discussions and exchanges on topics concerning technology, discoveries, issues, hopes and fears. During *X_Science* discussions are inspired by SciFi movies, from the origins to the most recent productions, with members of the scientific community discussing together with the audience.

Magdalena Galaj, from Wyższa Szkoła Informatyki w Łodzi (Poland), presented a paper entitled “*Students’ Motivation to Learn Chemistry – Polish Scene*”. The author pointed out that motivation is a key element of students’ education and plays a crucial role in the success of the overall teaching-learning process. During the presentation the author highlighted the difference between intrinsic and extrinsic motivation.

Olga Ferreiro and Filomena Barreiro, from Polytechnic Institute of Bragança (Portugal), presented “*Polymer Laboratory: Teaching Polymer Chemistry*”. The paper describes the results achieved within the science communication project CV/PVI/1386-Laboratório de Polímeros (Polymer Laboratory), financed by Ciência Viva – Agência Nacional para a Cultura Científica e Tecnológica (2006-2008). Several demonstrations and activities were developed concerning three main thematics: (1) Polymer concepts; (2) Polymer synthesis and (3) Polymer properties. Additionally, a fourth module entitled “Technological aspects” was also put into practice. The various modules were designed to reach a wide target public, including students from primary and secondary schools to undergraduate levels, and general society. The work highlights the concepts to be explained and puts in evidence different educational approaches designed to reach specific publics, rather than providing a thorough explanation of the experimental protocols.

Murat Demirbaş and Mustafa Bayrakci, from Kirikkale University Education Faculty, Turkey, presented a total of four contributions.

“*The Primary School Teachers Views Related to the Alternative Measurement and Evaluation Activities*” The paper presents a research aiming to determine the differences in primary school teachers’ views on the alternative measurement and evaluation activities used in the instruction of Science and Technology course depending on different variables and to assess the reliability of uses of these activities.

“*Analysing Technological Pedagogic Content Knowledge of Science Teacher Candidates According to Various Variables*”. Technological pedagogic content knowledge of teacher candidates was measured by qualitative semi-structured interviews by the researchers. Teacher candidates’ content knowledge was analyzed according to sex, class, age and having technology education or not. According to the results of the study, it is found that they were provided with the sufficient education on technology and pedagogy at university.

“*The Level of Science Process Skills of Science Students*”. Science process skills of university students has been studied. The survey consists of 36 multiple-choice questions with four choices per question. It has been administered to 556 freshmen students at total from Science Teaching Department in randomly chosen universities from seven regions of Turkey. It has been found that levels of the students could be described as tolerable, but some suggestions might be made to increase the level of science process skills in science teaching: 1.Course contents should be determined with the aim of improving science process skills of the students; 2.In accordance with the students’ science process skills development, various teaching methods



should be adopted; 3. Students should be directed to make research activities intended to develop the level of their science process skills.

“Pre-school Teacher Candidates’ Opinions about the Application of Science Activities”. A questionnaire was developed about pre-school teacher candidates about the application of science activities. As result of the questionnaire, preschool education is the centre of education and the starting point for science education. Children can do science and nature activities by experiments, observations and learning by doing. In preschool period the science education is not at a high level so it is not necessary to have high level of cognitive skills: the purpose of science education is not to make children learn the concepts about science but to be aware of the natural environment that they live and to have idea about it.

Hana Bartková, from Institute of Chemical Technology Prague, Czech Republic, presented “POPUCH, Popularization of Chemistry”. The paper presents major goals and approaches in training of science teachers and enhancing students motivation gained in the project POPUCH (Popularization of chemistry). The objectives of the project are popularization of chemistry and new chemistry fields mainly towards secondary school students. One of the activity is very popular among students, that is Lecture in Modern Chemistry - an interactive 45 minutes classroom show about chemistry as a life science and chemistry in everyday life.

Focusing on papers about students’ motivation, many interesting information and suggestions have been presented by different European Countries, but also by extra-European countries (i.e. Taiwan and Japan).

Paper presented are numerous and dealing with many different topics, but in a first approximation they can be grouped in two main categories:

- contributions dealing with initiatives and strategies, belonging to projects or provided by individuals, aiming at enhance students’ motivation at each school grade.
- contributions dealing with surveys, mainly based on test or interviews

The first group of contributions, provides interesting hints, sometimes very original, sometimes characterized by interdisciplinary aspects or by the use of ICT resources. These example of successful teaching methods mainly comes from the individual experience of teachers, from primary school to higher education, and represent a valuable help to teachers’ community. It is worth to be highlight that the activities presented are sporadic and tested on a limited number of students; they could be even more useful if structured in terms of long lasting research model, that foresees periodic testing carried out on a large number of students and updating of the educational tools on the base of the testing results.

The second group of contributions is constituted by the presentation of interviews and questionnaires proposed to specific groups of people (i.e. university students attending specific courses, primary school teachers etc.) with the aim of evaluating scientific knowledge, skills and opinions about some aspects of teaching, about the school system setting, or about the difficulties of their students. These researches are well structured and highlight strengths, weaknesses and possibility of improving science education.

Worth to be mentioned are the papers dealing with the use of ICTs as tool to science education at school. This new teaching methodology is adopted almost everywhere and the mean perceptions are the following:

- the impact on students is certainly positive. Their involvement in front of a digital resource is higher than in front of a book and this is natural because they belongs to the generation of high technology.
- on the contrary, teachers are not ‘digital natives’ and they are not prepared to use these new tools. If they use, as an example, the whiteboard as substitute of computers or textbooks, it is not sufficient. If they let their

students freely navigate in a site without giving a method or where to focus their attention, the activity can result dispersive and non constructive. For this reason it is necessary to provide teachers' training in order to correctly use the ICT teaching resources and make them valuable tools in the teaching-learning process.

- digital resources cannot replace the traditional teaching methods and the practical experience, such as laboratory activities. However, if suitably used, they represent precious friendly tools to integrate the teaching of scientific disciplines.

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: organisational aspects, conference contents, skills of the speakers and of the moderators, atmosphere during the conference and social events. The conference received a very good evaluation and the participants also made the following statements:

- *The conference was perfectly organized! The variety of participating countries was a real added value.*
- *Excellent atmosphere.*
- *Some presentations have been outstanding.*
- *Speakers' presentations skills were excellent, vivid and engaging. I appreciated very much the international audience and broad themes.*
- *I liked the possibility to meet people that are really interested in Science Education.*
- *The conference gave the opportunity to develop new ideas and knowledge in science teaching and learning.*
- *The conference sessions were very lively with a high level of participation by the audience and high quality discussions.*
- *The scientific contents of the conference were of very good quality focusing on new developments in science education.*
- *The conference offered interesting scientific contents and was informative about new development in science education.*
- *I fully enjoyed some of the presentations that were made by researchers who were experts not only terms of scientific contents but also in their presentation capabilities.*

The complete list of testimonials is available on the conference web site at <http://www.pixel-online.net/science/testimonials.php>.

Conclusions

The conference benefited by contributions from several countries in Europe, but also from the other continents; the list of speakers proves it. Moreover, considering the quality of the papers and the appreciation showed by the participants, the conference was an important event to present the actual state of art and foreseen future perspectives for enhancing attractiveness and effectiveness of chemistry teaching at school focusing on students' motivation.

Both school teachers and researchers contributed with their experience and work to make the conference rich of contents, hints for reflection and suggestions. In this regard, a consideration is needed: often the two worlds, school and university, work in parallel with the same objective, and rarely they communicate each other. The conference has been the opportunity to share their results and their views with the outcome of extend the mutual knowledge.

The final goal of these cultural exchanges, will be also, we hope, to lay the foundations for future collaborations between school teachers and university researchers, in a join effort to enhance science



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education, just beginning from the students' motivation. In fact, school teachers have the precious experience of the daily relationship with students, thus knowing their psychology and their difficulties to learn. On the other hand, researchers know how to carry out a well structured research in order to reach certain objectives, and are able to provide appropriate surveys. These skills, if used together for long lasting collaborations, would have a great effect on science education at each level.



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