

## ECTN – Links with Schools: Examples of good practice, Part IV

Starting from ECTN-Newsletter 1/2005 the Links with Schools-Group within the ECTN will regularly provide examples of how to cooperate between HE institutions and schools. The example of this issue is about a project by the University Federico II in Naples, Italy, to provide the students, at an early time, with tools and attitudes useful for studying Chemistry and other sciences at the University.

### The P.r.O.F project: orienting late High School students to University methodology in Chemistry and other Sciences

by A. Aronne\*, G. Avitabile\*\*, M. Di Serio\*\*, S. Saiello\*  
Univ. Federico II of Naples, Italy

\*Dept. Engineering Materials and Production \*\*Dept. of Chemistry

#### Objectives

The study of scientific subjects in Italian High School is traditionally limited, compared to humanistic subjects. Students at the start of University studies often experience difficulties, due to the lack of sufficient competence in Science, both on the factual ground and, even more important on the methodological aspects of Science.

The P.r.O.F. project has been carried out in last five years jointly by University Federico II of Naples and a number of high schools in the Naples area. It aims to provide school students, who have expressed interest in continuing science studies at the University, with tools that will help them in the transition from High School. Such tools include the use of Internet and the Web to publish projects and achievements in Science studies, the confront with other schools and the exchange of experiences.

#### The P.r.O.F. project

The project is based on disciplinary "tavoli d'area" (area tables) composed of University and School teachers of a given subject: Chemistry, Physics, Biology, and Mathematics. The area tables set up short courses that are provided to the students both in the University (in their last school year) and in the school (in their next-to last year). The courses are given in hours out of normal school time and try to focus on methodological, rather than factual aspects.

A fifth area table, named "Comprensione e Rappresentazione" (it can be translated Understanding and Communicating Science) is composed of teachers of Italian, graphics and drawing. Its purpose is to introduce students to the language of Science, as it is found in University textbooks, and to the proper use of different means of communicating information in natural language, formal languages, and graphical tools like Cartesian plots.

All the schools and all the subject areas share their programs, materials and achievements in a single web site <http://prof.orientamento.unina.it/> The site is entirely in Italian, due to the local range of the project.

#### The Chemistry section

The Chemistry teachers have agreed on the following general rules about the courses to be given in the single schools:

- the details of each course shall be defined by the teachers of the school that will actually carry it out.
- no new concepts of Chemistry shall be introduced. The courses will be devoted to methodological aspects of items that students have already seen in regular courses.
- only fundamental items shall be covered, in order to keep understanding the methodological aspects as independent as practicable from previous factual knowledge.
- the possibility of different approaches to the same concepts shall be emphasized.
- all the teaching material, as well as materials produced by students, shall be published on the Web site in order to make it available to other schools.

In addition, self-evaluation entry and final tests shall be produced and published. Note that this is not normal praxis in Italian schools, and it is suggested as an aid for the students to change their attitude towards techniques of study and assessment.

The activities of the project will often be carried out jointly by teachers of Chemistry and other subjects. This is intended to stress that the differences between different branches of science are often artificial, and that basic issues are often common. The students must understand that the problem of dimensions and units is common to Physics and that the laws of gases are studied both in Chemistry and Physics. The techniques of plotting data and acknowledging trends are best treated in Mathematics, and many biological problems can be discussed best in strictly chemical terms. The joint teaching between teachers of Chemistry and Italian is particularly important. Italian students have often good competence in the textual analysis of literature pieces, and they are led to acknowledge that a similar level of competence is necessary, and can be achieved, to extract the meaning of a scientific paper or textbook.

On these premises, most schools have chosen to select solutions and solubility as the main item in this experience. This subject is well suited to verify the importance of precise definitions, the difference between qualitative and quantitative aspects, the design of simple experiments to derive general concepts and to communicate them in natural, formal and graphical languages.

### **Development of the project**

The project is in course in Spring 2005. The publication of reports of the work done by students and schools was done in May. A public session of summative tests was held in May, to enable students of different schools to compare their achievements.

We expect that a substantial number of the students participating to the project will later enter studies of Chemistry or other scientific subjects in our University. We intend to monitor their careers and get statistical data on this group of students, to be compared with data from the general student population. Our working hypothesis is that such students will integrate faster in the University studies and reduce the number of failures to continue their studies, which is one of the biggest problems in newly enrolled students.

### **Rating according to ECTN criteria**

*Is the link personal, reliable, and cooperative?*

YES. In the close cooperation of university staff and school teachers all activities are negotiated, jointly prepared and carried out.

*Is the link acknowledged, networked, and is support available?*

YES. The link is networking the University Federico II of Naples with a set of schools in the surrounding. This also allows networking between the schools and teachers from different subjects.

*Is the link visible?*

YES. The project has its own website. Outcomes of the project are published on the web.

*Is the link attractive and helpful for the students?*

YES. The link allows students to get insights into university research and necessary qualification. It deals with additional content to those presented in schools, especially on methods.

*Is the link structured and evaluated?*

YES. The project is evaluated by tests and other assessment activities (see above).

**Information and contact:**

<http://prof.orientamento.unina.it/>