

# SUCCESSSES AND FAILURES OF ENHANCING THE BRIDGE BETWEEN SECONDARY AND HIGHER EDUCATION. PROJECT LAQUIMICA.NET

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## Abstract

Since 2004 the Department of Chemistry of the University of Girona promotes a series of activities to increase contact with high school students and teachers. These contacts allow for mutual assessment, provide better knowledge of the chemistry curriculum of students entering the University, foster improvements in teaching and innovations within the Bologna European Higher Education Convergence Process (EHECP), dims the frontier between secondary and higher education, and approaches University to the high school student.

Examples of activities consist of "The Saturday of Chemistry", oriented towards the last three years of high school, the "Chemistry Fair", meetings with high school teachers, class group laboratory sessions at university facilities, calls for prizes in high school chemical research, "Nano!Reacciona!", a preuniversity research workshop, and development of website "LaQuimica.Net".

These initiatives are indeed useful to improve teaching and learning. Furthermore, they allow to understand better the new role of university professors and makes innovation within EHECP much easier

## Keywords

Secondary Education, High-School Research, Information Technologies, Chemistry Fair, Science website, Chemistry Education.

## 1. INTRODUCTION

### 1.1 Minding the gap

Innovation of university undergraduate teaching is paramount in today's higher education policies. Besides innovating by enhancement of learning changes, innovation can be pursued also through an improvement of knowledge by and conditions of students entering higher education. Furthermore, universities can enhance their quality by acquiring a deeper knowledge of the world of secondary education. For the case of undergraduate studies in chemistry, the learning process is especially stimulated by student motivation, by awareness of university laboratories, classrooms and facilities, and by perception of dynamism of research groups.

One of the goals of the Department of Chemistry of the University of Girona (UdG) is to break the barriers separating higher education from secondary education. For that purpose, it has promoted the Project "LaQuimica.Net" (i.e., TheChemistry.Net) to shorten the gap separating high school students and teachers from university chemistry, to stimulate the study of science in general and chemistry in particular, and also to improve the social image of chemistry among the Girona society. In such a way,

one tries to break the frontier separating university from high school, so a high school student's entry into university is perceived earlier in his career, instead of the very day he registers for university courses. We think that all this may influence positively the undergraduate chemistry student.

## 1.2 Some global insights

When discussing the traditional and new missions of higher education, Jacques Delors states that "Excessive attraction to social sciences has broken equilibrium of available graduates for workforce, thus causing doubts of graduates and employers on the quality of knowledge provided by higher education" [1]. This is one of the main problems facing the reduced entry to chemistry from high school.

On the progress of science and technology, the 1998 UNESCO World Conference on Higher Education concluded that "Another challenge concerns the latest advancements of Science, the *sine qua non* of sustainable development". Furthermore, it also concluded that "With Information Technology, the unavoidable invasion of virtual reality has increased the distance between industrial and developing countries" [2]. We think that bridging the gap with high school is another aspect of sustainability.

In his book on the Hidden Side of the University, Kourganoff claims that "The lifetime of scientific knowledge is quite large for mathematics and physical sciences, decreases for molecular biology, is further reduced for social sciences, and becomes negligible for non scientific disciplines like philosophy" [3]. In chemistry, things do not change much with time from the point of view of high school students, which leads them to think it is not appealing enough. This is a society of change: if something does not change fast, it is perceived as uninteresting.

Finally, Francisco Giner de los Ríos, one of the most important persons for the Spanish University in the XIX century, wrote that "The Spanish University should acquire the characters of the Scientific German University and the Humanistic English University" [4]. This statement of the XIX century is still valid today.

## 1.3 The 2003 PISA report, or - we are the trailers

"Spanish students trail OECD in mathematics, science and reading" (El País, 7/12/2004 and special issue on 13/12/2004). The PISA report [5] started many alarms in Spain's education administration - even though it also allowed to assess the quality of Spain's educational system. The main conclusion seems to be that there is not enough expenditure in education and that results are far lower than European average.

Other key articles in the daily press do not allow either to be very optimistic about the public awareness of chemistry. We would like to draw attention to only a few articles appeared in the regional newspapers: "European solution in physics and chemistry" (La Vanguardia 31/3/2005), "Science is not enjoyable" (Avui, 13/11/2004), "Scientific, classic studies lose 40% of their students" (El Periódico, 20/12/2004), "Women are not attracted much to technology" (El Periódico, 20/12/2004).

## 1.4 Situation is worsening

The Spanish Foundation for Science and Technology (FECyT) reported in January 2007 its Third Survey on Social Perception of Science. One of its main conclusions was that the interest in science news is scarce, much below other interests like economy, sports, etc. Moreover, most surveyed people state that their scientific formation was not enough - however, they also say they actually do not care very much about science news. Actually, science is not perceived as an activity which should be prioritized in budget allocation.

Furthermore, the Spanish Ministry of Education is currently fostering a change of the curriculum of compulsory High School. Starting in 2007/08, Physics and Chemistry will no longer be compulsory in the 4th (and last) year of ESO (compulsory secondary education). Thus, the stakes of a student choosing the scientific-technological itinerary in Baccalaureate (two years, non compulsory, preuniversity) will decrease, and hence the number of tentative students for Chemistry will even decrease further.

## 2. OUR PROJECT

### 2.1 Here we are

Higher education policies are kind of transparent to citizenship, but are crucial to the higher education system. One of us keeps an electronic blog to discuss ideas and news related to higher education [6]. Some of the ideas therein are valuable for the present discussion:

First, there is a perception by society that the level achieved by students at the end of secondary education is decreasing steadily with time.

High schools cannot plan their needs for Baccalaureate. They may have an excess of social science teachers (usually not) or have too many science teachers (often). High schools have difficulties planning their coursework because there is not much flexibility, and especially because the students can choose their itinerary once they have been accepted.

In Spain (and also Girona), high schools are starting to advertise in newspapers or in the street. The decrease in birthrate has led to empty chairs. Furthermore, schools located in urban, middle-class areas are trying to attract middle-class students who can pursue secondary education, both compulsory (grades 7-10, ages 13-16) and optional (Baccalaureate, grades 11 and 12, ages 17-18).

Sometimes the Government does not state things clearly. For instance, some time ago they stated that Spain needs 60,000 scientists in the near future. This quantity is obviously exaggerated, in fact it is impossible to generate such a large amount of good scientists in the forthcoming years.

A recent report shows that libraries of primary and secondary schools are underused; actually, they do not seek their transformation into a unified source for knowledge and service like university libraries do.

### 2.2 Chemistry among us: let's discover chemistry in Girona

Indeed, the presence of science in our society is steadily decreasing. Such a decreased impact brings about a lower number of students entering the last two years of high school (Baccalaureate) by registering for a scientific-technical itinerary. This lowering is further increased by the decrease in birth rate in the second part of the 80s, which translates into few 16-year old students. Moreover, more male students than female ones among those following a scientific-technical itinerary end up in technical schools, thus leading to sex-biased scientific classrooms. Thus, science in general and especially chemistry seems to proceed backward - in its prestige and also in its image among society.

**DESCOBREIX LA QUÍMICA A GIRONA**

**Departament de Química**  
(<http://www.udg.edu/dquimica>)

- Grup de Catalisi i Bioorgànica
- Grup d'Enginyeria Molecular Química
- Grup de Microbiologia Molecular i Microbiologia Molecular
- Grup de Química Analítica Ambiental
- Laboratori d'Anàlisi de Processos
- Professorat en Química Orgànica

**Activitats**

- Recerca bàsica
- Recerca aplicada
- Relacions amb la societat

**Recerca bàsica i aplicada**

- Noves tendències en catalisi
- Procediments analítics de l'ADN
- Aplicació de biomaterials
- Formació de nous materials
- Disseny de Verres
- Organosíntesi de compostos en el medi ambient
- Estructuració de virus i base de durs
- Anàlisi d'alt per a diagnòstic clínic
- Mineralització de processos naturals i catalisi
- Relacions amb la societat
- Catalisi asimètrica
- Enconjugament supramolecular
- Plàstics antimicrobians i anticarcinògens
- Nova molèstia de sucre

**Química i Societat**

- Projecte LaQuimica.net (<http://www.laquimica.net>)
- Dissolve in La Química
- Projecte d'Investigació de Recerca en Química
- Jornades amb els mestres de secundària
- Actualitat per CSO i Radiofòrum
- Divulgació científica

**LaQuimica.net**

In the last years the Department of Chemistry of the University of Girona has developed a series of activities to promote science in general and chemistry in particular to the Girona society, its local environment, both for secondary education and general public. Such a promotion consists of participation in the Science Week, organization of The Saturday of chemistry, participation in Open University Day and University Research Day, and also in research dissemination by means of local newspapers. Furthermore, the Department of Chemistry led the initiative that conferred a Doctorate Honoris Causa to a leading Catalan chemist, with wide social feedback.

Chemistry professors at the University of Girona have been analyzing the actual reasons of this situation and try to provide some solutions. Thus, we have met a few times with high school teachers and organized different round tables, like that on "Society, Chemistry and Girona" on 4 November 2004. These words constitute one of the slogans to communicate and disseminate science within our local territory.

It is of utmost importance that a University promotes all disciplines so they are perceived at a similar level by high school students that are entering their final two years, i.e., registering for the Baccaulaureate - they must choose among a wealth of optional courses. Furthermore, it is also appealing to reach adult populations and, of course, take into account the needs of senior citizens, who request for more information and knowledge. This is actually a new goal of universities - public awareness.

The authors of this communication, as members of the working team named by the Department of Chemistry, proposed the "Society, Chemistry and Girona" line of work to have a first phase consisting of the project "Chemistry among us: discover chemistry in Girona". Due to financial, resource and time limitations we thought initially of four actions:

- Printing appealing material on the research of the five chemical research groups in the Department of Chemistry.
- Providing promotional gifts: periodic table with chemical logos related to Girona (e.g. chemical chimney); year calendar with 12 sheets with chemical motifs and UdG material.
- Building (and especially maintaining) the website "Chemistry among us: discover chemistry in Girona" using a suitable CMS (Content Management System), later renamed "LaQuimica.Net".
- Creating a series of videos on research and chemistry with destination high school students - a series of imaginative episodes and interviews with local chemical researchers.

At present the third action is well advanced, while the first two are in the process of find proper financing, and the fourth one is waiting for proper financial sources.

## 2.3 The main bridge

The aforementioned ideas evolved later into project "LaQuimica.Net" , which is an integral plan to disseminate chemistry, to build up relation with Girona society, and to increase overall interaction with secondary education. We chose this name because not only actual activities are held, but also virtual activities are proposed through a suitable Content Management System via a website and the Internet.

Here are some activities held so far, during the three academic years 2003-2007:

- The Saturday of Chemistry
- Chemistry Fair
- Workshops with high school teachers
- Dissemination of chemistry through the website "LaQuimica.Net"
- High school research prizes in chemistry
- Laboratory sessions by high school class groups in department facilities
- Nano!Reacciona! Preuniversity Research Workshop

The Department of Chemistry collaborates in more general activities like UdG's Open-Access Day, tutoring of high school research works (Botet i Sisó fellowships), UdG Research Faire, or Science Week. Furthermore, new activities are planned.

## 2.4 The Saturday of Chemistry

This is the star activity of our relationship with secondary education. It is organized with different dates for students of the 4th year of ESO (Obligatory secondary education, equivalent to grade 10) and for students of Baccaulaureate (equivalent to grades 11 and 12). Three editions has been organized so far (2004, 2005 and 2006), with seven Saturdays and 600 students from the geographical environment around the University of Girona. The fourth edition is scheduled for spring 2007, with two different dates for those two kinds of students.

Each Saturday consists of a talk by one of the researchers of the Department of Chemistry, a coffee break, four laboratory activities, and a guided tour to the research laboratories and Department facilities. The activity lasts about 4 hours.

An example of the lab sessions for the 3rd edition of The Saturday of Chemistry is:

Session 1. What is there in this liquid? Let's determine the compositions of an aqueous mixture that may contain Manganese (Mn), Copper (Cu) or Nickel (Ni) by means of specific reactions of these three metals.

Session 2. Let us levitate a metal - superconductivity. We demonstrate the phenomenon of superconductivity by levitating a magnet on a superconducting ceramics at -196 degrees Celsius. The colors of halogen gases. Students identify the different halogen gases by means of oxidation reactions.

Session 3. A remedy for headache - identification of the main components of a (medical) drug. Students analyze drugs using chromatographic techniques.

Session 4. The molecular conundrum. The structure of a drug must be guessed using computers and molecular design software.

Safety equipment is provided to students glasses, one-time white coat, gloves. They also receive some office material.

Before leaving, participants are given a form to evaluate the activity. They rate a variety of items, ranging from the general organization to cleanliness or each particular laboratory session.

Students must keep their attention during all Saturday morning. A quiz is proposed, and those who solve it qualify for a prize - usually scientific books. Some students have complained the Saturday of Chemistry is too intensive, with too many "emotions". However, we have found nobody who complains of having found a less-than-expected activity quality.

Laboratory activities that allow participants to touch and use glassware, reactants and equipment are best rated. Sometimes high school chemistry does not allow for much actual involvement into real chemistry; here students can get actually involved.

We already teach to undergraduate students who attended the first edition back in 2004 and are now enrolled in university chemistry courses - they remember this activity, and rate it as one of the key reasons that make them take the decision to enter chemistry.

As far as grade 10 is concerned (4th year compulsory secondary education, ESO), 2004 students are about to enter University, so any assessment will have to be done in the forthcoming two years. Only time will tell whether our efforts are useful.

## 2.5 Chemistry Fair

This fair is organized during the festivity of St Albert, the traditional Patron Saint of chemists, which happens to end the Science Week at the University of Girona and also at many other educational and research institutions.. This activity, addressed to general public, tries to approach participants to the essential aspects of chemistry, and to provide awareness of the way chemistry influences everyday life. In particular, the 2005 Chemistry Fair consisted of the following activities:

Exhibit "Chemistry between ovens" (Química entre fogons) - an exhibit of product found in a typical kitchen or home, as seen from a chemical point of view. For instance, we gave clues on the relationship between olive oil and margarine, or provided hints about adding Royal® to get nice pastries.

Demonstrations:

- What is a superconductor? Demonstrating the phenomenon of superconductivity having a magnet levitate on a superconducting ceramics at -196 degrees Celsius.
- The frozen corner: let's petrify a flower. A demonstration of the change in properties of materials with temperature.

- Everyday Chemistry: acid-base chemistry of everyday products. Demonstration of acid-base properties of products available at a household.

Finally, we scheduled the talk "The Image of Chemistry" by the Director of the Catalan TV daily program "The environment" (Sr. Xavier Duran, "El Medi Ambient", TV3)

The 2006 edition of this activity was very similar, with a higher success because the amount of advertisement by the Department was higher.

## 2.6 Meetings with high school teachers

We have organized various meetings with local and regional high school researchers. For instance, on Science Week 2004 we gathered for a round table "Society, Chemistry and Girona". Likewise, on February 2006 we organized the workshop "Chemistry, Bologna and Secondary Education" in order to explain the process of adapting chemical studies to the new European Higher Education Area. This meeting allowed for different points of view of the so-called Bologna Convergence Process as issued by university and high school members. Actually a lack on information was realized among high school teachers. Recently, in January 2007, another meeting was conducted devoted to "High School Research and the University"

Moreover, these meetings allowed to discuss problems faced by high school teachers and to propose different measures by universities in order to motivate high school students to pursue a career in science and especially in chemistry.

High school professionals think the time dedicated to chemistry in high school has decreased with successive educational reforms in Spain. They also complain of small laboratories, low budgets for equipment or reactants, and especially a small number of students becoming interested in chemistry.

## 2.7 "LaQuimica.Net" website

Building and maintaining a website oriented towards high school students and to citizenship requires a fair amount of time and allows to predict wealthy benefits. One of them -and not the smallest one- involves cataloguing and preserving historical and natural heritage related to chemistry. For instance, spring water sources or mineral and rocks, or former factory chimneys and abandoned industrial parks. Discovery and surprise are two of the main items of this electronic information system, which is lightweight so it can be fast accessed from home - i.e., no heavy animations, no lengthy videos.

This website is kept separated from the Department website, which is reserved to internal information and administrative purposes. This notwithstanding, LaQuimica.Net does also inform about the main academic activities of the Department of Chemistry.

LaQuimica.Net was built from the very beginning as an easy-to-use website, where information might be furnished by academic personnel and administrative staff. We chose the MAMBO Content Management System (since 2005 unfortunately forked into JOOMLA - <http://www.joomla.org>), an open-source code based on Linux, MySQL, PHP and Apache. Its main functionalities are automatic care of news, user accounts and restrictions, a very simple administrative interface, a simple management, and safety and robustness.

The main contents of the LaQuimica.Net website are:

- Chemistry and Girona
- Society and chemistry
- Chemistry and us.
- Research in chemistry at the UdG
- Odds and curiosities
- Molecular inventor
- Chemical magic
- Quizzes and challenges
- Courses and meetings

- Documentation

Like other chemistry awareness websites (see e.g. the high school, kids and parents sections of the ACS website, <http://chemistry.org>), we try to offer games that may encourage web surfers to become interested into chemistry. For instance, a chemical Sudoku is offered where visitors can obtain prizes - but instead of digits we use the letters of "laquímica" (note that i is different from accented i (í)). Sudokus are offered in almost all newspapers and seem to become a favorite. Note that a good scientific introduction to this educational amusement can be found in the June 2006 issue of Scientific American, <http://www.sciam.com>

In its first phase, the LaQuimica.Net website is entirely written in Catalan, but in a second phase we project to make a simultaneous English version available.

## 2.8 Prizes for Baccalaureate Research in Chemistry

High schools have some difficulties to promote research studies related to chemistry (the research work is compulsory for their last-year students). Within the scientific area, it is far easier to carry out natural or environment studies. To foster studies within chemistry, we called for chemistry research prizes, consisting of three different levels. They are independent from and compatible with other prizes offered by the University of Girona or by the Catalan Government.

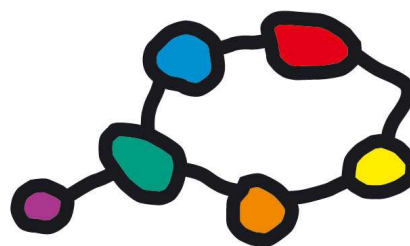
The fair amount of high school research studies allowed in 2005 and 2006 (1st and 2nd edition, respectively) to organize an academic session where the three studies obtaining the prizes were publicly reported through a 15-minute presentation, while allowing the organizers and academic authorities to address parents, students and high school teachers. This activity has been discontinued, though, and evolved into the Nano!Reacciona! workshop described below.

The 2005 prize went to a study on "Colorants: use and abuse - study of colorants in gummies). In turn, the 2006 prize was awarded to the study "Chlorine, pool disinfection".

## 2.9 Group-class laboratory sessions

For High Schools a good possibility consists of taking those students who are registered for chemistry courses for a visit to university laboratories. During the last two years a number of group-classes from high schools near Girona have visited the Department of Chemistry facilities to take practical lessons. Actually visits have been received during the interval between semesters, when the laboratories are not used by university students.

Overall this experience has been quite positive, because in many cases students have been put in contact with a laboratory having much better equipment than those of high schools. The small number of hours which can be dedicated to chemistry lab in high school can thus be increased through this activity. Furthermore, students have realized that the University is not something strange and out-of-this-world; on the contrary, it is a open space, with normal people and fairly good facilities for the everyday work. Finally, their contact with university academic personnel and a reduced student/instructor ratio has been rated as very positive.



LaQuimica.Net

## 2.10 Nano!Reacciona! Preuniversity Research Workshop

The aforementioned Prizes for research projects in the last two years of high school, awarded in the 2004/05 and 2005/06 academic years, have evolved into a new activity for the present 2006/07 academic period. On April 13, 2007 we are organizing a gathering of high-school students that pursue research related to Chemistry (and also those that finished research one year ago), in the same spirit and organizational sense as a normal scientific venue.:

- 3 pm Opening of the workshop
- 3:15 pm Plenary Lecture
- 3:45 pm Poster session

5:15 pm Round Table on posters  
5:45 Prizes for best posters  
6:00 End of workshop

We expect an attendance of ca. 50 high-school students whose posters describing their research will be spread all over the Faculty of Science entry hall. Moreover, we expect an additional attendance of families, scientists, and secondary education teachers.

The purpose of this activity is to allow all students pursuing high-school chemical research to participate in an amusing, scientifically valuable activity. Prizes for Search works, which had a limited impact into Society and brought few people to our Department, will thus be substituted by a much broader scope workshop which is likely to better motivate science students.

## **2.11 Other activities**

The University of Girona, like many other higher education centers, opens his doors to prospective students and their parents. For instance, on 31 March and 1 April 2006 a scientific booth was displayed outside the Faculty of Sciences, where we proposed some scientific games and demonstrations, like understanding the physicochemical intricacies of a microwave oven. Likewise, we emphasized the aspects of molecular gastronomy, a fancy aspect which is gaining widespread attention in our area. For instance, a very recent book by a three-star Michelin Guide restaurant has launched an interesting thesaurus (ALICIA 2006) on scientific gastronomy.

For this 2006 particular activity we designed a large banner with the title "Discover Chemistry in Girona", which is used every now and then for other activities organized by the Department of Chemistry: This activity will be likely repeated in 2007.

## **3. THE OUTCOME**

### **3.1 The feedback**

All activities carried out within the Project "LaQuimica.Net" have received positive feedback and thus have qualified positively. In particular, high school students rate high their attendance to "The Saturday of Chemistry". In turn, high school teachers find especially valuable the possibility of keeping in touch with the higher education system. A point worth pointing out by attendants is the loss of fear to the university and to science by students. Those high students which are oriented towards science studies and participate in our activities are less likely to drop from their way, since they realize that science is not so difficult as it may seem at first.

Students of 4th ESO or Baccalaureate (16-18 y.o.) rate differently "The Saturday of Chemistry". For the 2004 and 2005 years, we organized similar activities for all high school students, which resulted in lower rating by younger students - they claimed some difficulties to follow instructions and reasoning. In 2006 we organized this activity with slightly different levels and requirements for 4th ESO students and older Baccalaureate students, which resulted in better recognition and value.

Overall, everybody agrees with the possibility of taking laboratory sessions in well-established laboratories with professional instructors. One must realize that some high schools have difficulties to organize laboratory sessions in their facilities, thus difficulting the right perception of chemistry by students, and thus their learning process.

All activities linking higher education and secondary education are useful to improve teaching at the university undergraduate level. First, instructors and professors know better the high school curriculum and understand the way students feel about the University. Second, they realize the kind of chemistry students learn in secondary education and the level achieved at the end of high school, so they are able to challenge and change the way they teach and also the way chemistry should be transmitted and learnt by the students within the reform of higher education - the Bologna Process. Furthermore, university personnel understand better their role and eases innovation in teaching and convergence with other European higher education schools. One may say that university academic personnel, when sharing experiences with high school students, leave the university without actually leaving it.



### 3.2 Difficulties carry new ideas

Some difficulties encountered in the contact with high school students have emerged. Among them, we find first that the diversity of primary schools in our region is not duplicated into high school. Perhaps that will change in the near future. We hope we will not arrive at the situation that equates diversity with segregation (Atlanta Constitution-Journal, 18/9/2005).

Students are lured to attend some activities, like The Saturday of Chemistry. Our society, unfortunately, is becoming more dependent on stimulation, advertisement and less on encouragement. Within the so-called "Economy of Attention", one has to fight for those few spare hours of high school students, trying to call their attention. We must provide them with breakfast if they visit the Department, we must pay schools for transportation to compensate for low budgets.

Science is difficult! The language of science may be concise, but the amount of words and techniques required to understand it well is large. Students must spend their valuable time trying to understand equations, trying to translate a physical world into a virtual, abstract world. There is no science without mathematics. That's the problem with many students. Furthermore, the difficulty of studying science and chemistry is further stressed by the present Society of Interruption. The quietness of the past has turned into constant interruption (cell phone, e-mail, phone) in the present. Science requires concentration.

However, Information Society brings about new, interesting ways of socialization and thus learning (opposite to a negative use of the Internet like the powerpointization phenomenon). During this last year, blogs have emerged as a powerful procedure to learn, to teach and to evaluate. Blogosphere is becoming an idea-wealthy part of the Internet. We have had good experiences with blogs and chemistry students, so we plan to extend them to the bridge with secondary education. We think that blogs and interactive websites may turn a potential chemistry high school student into a prospective one. Wikis are also emerging as powerful collaborative tools and promise to play an important role in the future of learning.

### 3.3 A final remark

Just one not-very-happy-ending: it seems that home chemistry is under assault. Fears of terrorism and especially insurance worries prevent interesting chemistry sets enjoyable by kids to be put into the market. Will chemistry become kind of a secret science? It is likely that some people already do think so. The bridge with secondary education must prevent this new phenomenon too.

This article deals with some aspects of Education. Much can be done to innovate University teaching and especially learning of Chemistry. We would like to remember that, as has been mentioned elsewhere (as stated in summer 2005 in plastic bags at the University of Georgia, Athens - attributed to philosopher John Dewey), *Education is not a preparation for life, it is life itself.*

### 3.4 Acknowledgements

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We must acknowledge the active and enthusiastic involvement of many members of the Department of Chemistry in all stages of activity organization. We should thank them for their help, because their participation has been a key reason of the success of the overall Project.

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