

A Cross-Disciplinary, Multiclass Educational Project

by Johnny Marcelin and
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During the 2011-2012 school year, and to commemorate the 2011 International Year of Chemistry, the Lycée Français d'Irlande in Dublin (LFI) launched an innovative educational experiment on the theme of chemistry that involved every level (20 classes from kindergarten to sixth year) and every subject (French, Spanish, music, history . . .).

The Lycée Français d'Irlande is a school recognized by the Agence pour l'enseignement français à l'étranger' (AEFE) with almost 500 pupils at two sites 7 km apart: a primary school (300 pupils) in Foxrock and a secondary school (190 pupils) in Clonskeagh. LFI is a partner with St Kilian's German School in the Eurocampus: a bi-lingual educational program for the first to third year of secondary school. The Eurocampus unites both schools, allowing for a bilingual teaching program that integrates these classes into the Irish educational system, thus offering pupils greater proficiency in English.

In 2011, the LFI, with the support of the scientific section of the French Embassy, decided to use the theme of the International Year of Chemistry to make pupils more aware of science, especially chemistry, in the context of a multidisciplinary teaching approach.

The IYC educational project undertaken by the Lycée Français d'Irlande gave rise to a model of scientific communication through which students made connections with places and subjects where they wouldn't expect to find chemistry. At the same time, the curriculum avoided reducing the chemistry to popular science. The goal was to develop a dialogue structured both horizontally with other disciplines and vertically with classes of all ages.

"The educational objective of the 'Chemistry and Sound' projects in second year and 'The Song of Nylon' project in fifth year was to foster the growth of knowledge of physics and of literary techniques.

During the 'Chemistry and Sound' project, the pupils carried out research on the great French chemists, wrote their biographies, and recorded their readings of them for an audiovisual presentation. Through this work they discovered the impact of chemical research on our daily life and became familiar with knowledge that can sometimes seem abstract. They also worked on writing their texts, and on reading aloud, which has to be perfect to be recorded.

The older children created a poetic documentary in the style of a documentary by Alain Resnais called 'The Song of Styrene' which they called 'The Song of Nylon'. They filmed the scientific procedure to explain the formation of nylon, and the pupils wrote a text in verse containing scientific explanations.

This work was focused on the following: disciplined work on oral expression, the pleasure of learning physics, and finally the acquisition of scientific knowledge through the history of science and experimentation. The pupils were actively involved in the project from setting up the experimental protocols to directing the scenario and the film. In this way, pupils from the different streams—literary, economic, and social and scientific—were able to see how they complement each other and the close link that can be created between art and science."

*Laurence Penny, French teacher
and Johnny Marcelin, physics teacher*



The Year of Chemistry at the Lycée Français d'Irlande

This dialogue between chemistry and other disciplines allowed the development of less traditional methods of acquiring skills.

"Chemistry, as a purely scientific discipline, seemed to offer few opportunities for a literary approach. However, the exotic character of the names of the elements and of some chemical reactions invited a playful and creative approach. 'L'Ouvroir de Littérature Potentielle' (OULIPO –the workshop of potential literature) beckoned, because it proposes an approach to literature which is at the same time poetic and systematic, even scientific: a question of writing while following the strict constraints inspired by the mathematical spirit. Olivier Salon, mathematician and writer, and an active member of OULIPO, therefore came to lead writing workshops on the theme of chemistry in the classes of third and fourth year. The plan: the collective writing of a text featuring all the letters of the periodic table in order, texts saturated with the sounds 'shi' and 'mi', with the sound of certain elements, Al, Cu, S, (parachesis) or even Alexandrine quatrains in an elogy to the elements. The educational interest of the project was to propose activities which were at the same time very demanding with regard to linguistic command and motivating because of their playful character. It also allowed the scientific and the literary to be brought together while casting a discreetly irreverent eye on matter, which was salutary in a project as vast and serious as the one we were engaged on."

Dorothee Potter-Daniau, French teacher



In 2010, "The Gastronomic Meal of the French" was inscribed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity. The International Year of Chemistry provided a perfect opportunity to publicize the link between chemistry and gastronomy. With that in mind, internationally renowned chemist and cook, Hervé This conducted workshops for students at LFI on 26 and 27 September 2011 in which he introduced them to the discipline of molecular gastronomy.

In the primary school, many projects during the year were based on a hands-on approach to "doing chemistry." The investigations carried out were enriched as soon as possible by work in the senior school's laboratory to show the continuity between science in primary school and in secondary school.

"In the context of the Year of Chemistry and of their own class project, 'Chemistry and Health,' which specifically dealt with food, the fourth class [was] brought to the senior school laboratory to carry out tests which revealed the presence of certain chemical products in everyday food. Just the word 'laboratory' was enough to motivate the pupils: the project went beyond the context of group work in class to take on a whole new significance in the official place for scientific experiments. One pupil even said that she was going to 'make her dream come true'...

They were welcomed by the headmistress, then walked along the corridors of the senior school with their eyes wide open, suddenly feeling small but honored. Then they were met by the biology and chemistry teachers, who taught some of their older brothers or sisters: the young chemists were able in one day to cross the years which separated them from adolescence. They were impressed by the teachers' white coats, the lab tables, and the proper chemistry equipment: test tubes, protective goggles, spatulas, [vials] of powder ... They were given instructions about the protocol of chemical experiments: handle powders carefully, note the characteristics of ... each food product before mixing it, observe the reaction (change of consistency, color) after mixing it. Concentrated and curious, they took up the challenge of finding the mystery food by comparing chemical reactions and went back to school and then home proud of having taken their place in the secondary school.

A human experiment, whether scientific or not, to be repeated to strengthen the link between primary and secondary school and focus our pupils on after fifth class ..."

Marie Audidier, fourth class teacher

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"Thanks to this project, the pupils of second/third class discovered that chemistry is all around us. In second class, the work on milk and eggs allowed the pupils to observe the chemical transformation of different substances. In third class, making recycled paper emphasized sustainable development while broaching the chemical aspect. The pupils were able to finish their project by making recyclable plastic in the chemistry laboratory in Clonskeagh with the secondary school science teachers. This project was all the more valuable to them as they were put in the real situation of 'little chemists'. They have great memories of this activity. The pupils' involvement and enthusiasm in preparing the exhibition were apparent, and it's obvious that this project was a great success."

Corinne Pieussergues, second/third class teacher

During the year, several different approaches to scientific communication were utilized: health café, conferences of experts, and a visit to a factory in which the pupils' involvement was as important in the preparation phase as in the actual visit and the circulation of information. Our aim was to show that there is no split between the science of laboratories and researchers and the science taught in school.



On 17 April 2012 Gérard Férey visited the Lycée Français d'Irlande as part of its year-long IYC project. Férey is a French chemist, academician, and inventor of hybrid new materials. In recognition of the international impact of his work, and his long and brilliant career (with more than 600 scientific papers), Férey was awarded the 2010 CNRS Gold Medal, France's highest distinction in scientific research.

"In the context of the Year of Chemistry and my teaching of economics and management, we decided to involve the fourth years in the overall project through a visit to the Servier pharmaceutical plant in Arklow. The pupils were divided into groups, with one group responsible for preparing questions and a more in-depth reflection on three chapters of our course with an economic dimension:

- How does the business create value? The added value of a medication
- How does the business launch itself on a new market? Innovation
- How does the business fix the price of a product? Patent protection, profitability of innovation, and competition from generic products.

A second group was to look at the social dimension by taking the chapter further:

- What is the place of the individual in the business? Recruitment, (qualified/non-qualified), continuing education, evaluation, promotion, and remuneration of employees.

The visit to the plant in Arklow and many interlocutors allowed us to give a more concrete turn to theoretical notions grasped in class like the discussion on the question of individual bonuses paid (or not) to employees who came up with innovative ideas."

*Allain Mikaël,
Economic and Social Sciences teacher.*

To communicate as widely as possible was at the heart of our project. Disseminating the pupils' work through modern media (www.chimie2011-2012.blogspot.ie) allowed it to come out of the classroom, creating a dynamic that brought the whole educational community together. The collective work of all the classes gave rise to an exhibition on 12 May 2012 of 30 or so class projects on 4 themes linking chemistry to water, health, cookery, and scientific innovation. The exhibit featured images of chemistry from the students' daily lives through panels that mixed drawings, texts, graphs, videos, and sounds.



The Outcome

The project had multiple objectives.

- The teaching of science: to make students aware of science by putting them in direct contact with practical applications in their daily lives. To develop an appetite for science starting in primary school.
- The pupils' career choices: to promote scientific careers to our students. While many students take the science stream in senior cycle, we've noticed a reduction in those going on to do science after leaving school, with more doing business studies or other subjects.

- Break the subject stereotypes: encourage and promote science careers for girls through example (conferences and meetings with numerous high-level scientists)
- Break down the barriers between subjects: introduce the theme of chemistry in all subjects in order to challenge the idea that the subjects are not connected.
- Introduce a team project and a practical exchange between the educational teams: this project was also the departure point for a rich educational exchange between the primary and secondary school teachers and between the different subjects around the scientific theme.
- Reinforce the sense of belonging and cohesion of the educational community in the school.

Most of these objectives were achieved. An analysis of the career choices of our current pupils will allow us to follow the pupils' and particularly the girls' choices in the years to come. 🧪

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 www.lfi.ie/chimie.html
www.chimie2011-2012.blogspot.com

Meeting with IUPAC President Nicole Moreau

On 1 November 2012, Nicole Moreau, at the time president of IUPAC, visited the LFI and met with a group of 16-year-old girls to share her experiences as a female scientist. Speaking to the group, Moreau shared her enthusiasm and talked about how “chemistry is everywhere.” Over the course of the year, this group of girls interviewed several women scientists from varied backgrounds; the project culminated with the girls participation in the Women in Technology and Science's conference that took place on International Woman's Day (1 March 2012).

Later that evening, Moreau introduced *Effervescences*, a scientific one-man show specifically addressed to parents of students in LFI.



Also during her visit in Dublin, Moreau delivered a lecture on “Madame Curie—More than the Scientist” to around 100 researchers and postgraduate students and professors from Trinity College Dublin. At the end of her stay in Ireland, she took part in the “Festival Robert Boyle” in the historic “Lismore Castle”.