518300-LLP-2011-IT-COMENIUS-CNW

# Chemistry Is All Around Network

Working group meeting "Teacher training"
Louvain-la-Neuve, Belgium, 6 May 2013

The meeting took place at *École Normale Catholique du Brabant Wallon* (ENCBW). It gathered the experts and teachers from Liège and Louvain involved in the project "Chemistry is All Around Network", a total of 17 participants.

**Participants:**

- **Divna Brajkovic** (HELMo): chemistry teacher
- **Bernard Leyh** (University of Liège): teacher trainer (*agrégation*)
- **Jean-Luc Pieczynski** (SeGEC): educational counsellor
- **Myriam de Kesel** (Catholic University of Louvain – UCL): teacher trainer (*agrégation*)
- **Bernard Tinant** (UCL): chemistry teacher trainer (*agregation*)
- **Nathalie Matthys** (ENCBW): chemistry teacher trainer (*agregation*)
- **Laurent Gruber** (ENCBW): chemistry teacher
- **Yannick Lejeune** (Institut Providence Herve): science teacher (chemical technicians).
- **Simonne Marganne-Liégeois** (Institut Providence Herve): science teacher ($3^{rd}$ – $4^{th}$).
- **Véronique Bolline** (Collège Sainte-Véronique): science teacher ($3^{rd}$ – $4^{th}$).
- **Sabine Jacquemin** (Collège du Sartay) : science teacher
- **Nicolas Dabin** (ENCBW): future teacher
- **Anne-Charlotte de l'Escaille** (ENCBW): future teacher
- **Zlata Selak** (INFOREF)
- **Julien Keutgen** (INFOREF)
- **Mariagiovanna Ricciarelli** (INFOREF-PIXEL intern)
- **Geneviève Berck** (INFOREF): computer engineer

## 1) Project activities:

Reminder of the main project activities: gathering interactive resources on chemistry and creating a European network. The second year of the project is dedicated to teacher training.

## 2) ICT resources:

Interactive resources are identified and experimented all along the project. Twenty resources have been identified. New resources are being created.

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2.1 “Existing good practices”

Presentation of the resource database on the portal. Reminder of the username and password. The identified resources are gathered in a list according to the Belgian curriculum. They will be tested in schools.

2.2 “New lesson sequences"

**Using the IWB and modelling as a complement of the experimental approach. Theme: discovering the chemical reaction**

Divna Brajkovic presented a resource created in collaboration with Inforef on the chemical reaction for third year students (14-15). This learning sequence associates experiments with the systemic approach. Therefore, activities (lab, phenomena observation, modelling) are structured so as to foster a progressive gradation of abstraction levels (macro- to microscopic). The IWB offers an open and interactive writing all along the sequence.

Varied ICT resources integrated on this support make modelling of phenomena, and thus abstraction, easier. These tools make it possible to vary visual supports to foster understanding of dynamic (observed or produced) phenomena. The student can make screen captures of films and animations to grasp important moments of certain phenomena.

Moreover, the important step of modelling is highly used in different approaches: atom and molecule modelling with the IWB, flash animations, a PHET animation and more traditional models (molecular models). This diversity of supports addresses different types of intelligence and thus helps learning complex phenomena.

This sequence is inserted in the “teaching resources” database and on Inforef. It was used during a training session for teachers (organised by CECAFOC).

**The IWB at ENCBW: new lesson sequences being built with science students**

All the new resources are gathered on Didac-TIC.

Nathalie Matthys and an ENCBW student presented a resource on the chemical reaction usable on a computer (individually or with a projector), adapted to people with reduced mobility. It contains a lesson, a synthesis and an exercise.It confronts students’ preconceptions with reality. Several sequences have been created by students (future chemistry teachers).

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**How can the systemic approach optimise chemistry learning? What part can ICT have?**

Jean-Luc Pieczynski proposes to optimise chemistry learning organising lesson sequences with the support of systemic strategies and with animations, films, videos, simulations, metaphors …illustrated on a computer support.

Chemistry is explained with molecules, ions and atoms, objects that elude senses. Students must build representations of them and of their behaviours. Only ICT can propose a representation of those objects and of their dynamics.

This approach to learning is adapted to the constructivist context. Reality is complex. Confronted to an event, one can only list the possible evolutions and adjoining probabilities. The vocation of science is to build models to manage reality intelligently. To grasp reality, it must be modelled, simplified in a representation that highlights the links and the dynamics of the system. Priority to non-linear reasoning, analogies and metaphors.

These instructions were used to build lesson sequences to be tested in class (conclusions in 2014). They can be integrated in teacher training during internships and practical lessons (students build sequences and learn how to use the IWB in a relevant way). Those lesson sequences will use ICT resources created in collaboration with Inforef. Examples of sequences:

- Molecule
- Chemical transformation
- Chemical reaction
- Indices and coefficients
- The Mole and Stoichiometry
- Metal corrosion

## 3) National synthesis on teacher training

Current situation and prospects of initial and continuing training and the reforms proposed in the *Fédération Wallonie-Bruxelles*.

There are two courses of study:

- *AESI*: the ***régendat*** (three years) takes place in schools and trains lower secondary school science teachers (12-15 year students);
- *AESS*: the ***agrégation***, achieved at university after a five-year training, is necessary to teach chemistry in upper secondary schools (15-18 year students).

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*AESI*: teacher training at ENCBW (Nathalie Matthys)

AESI (*Agrégé* of lower secondary education): three-year vocational baccalaureate, divided in sub-sections including a "science" section. Organised by a decree of the 12th of December 2000. It aims to achieve thirteen skills based on six axes:

- Social actor
- Pedagogue
- Practitioner
- Educated teacher
- Person
- Researcher

There are three types of course: common courses for all sections; courses for a specific section; practical activities in small groups. Internships and practical training workshops (AFP) take place during the three years.

- Weaknesses:
  - students' scientific level;
  - difficulty to find internship and AFP supervisors;
  - contrary visions between internship supervisors and trainers;
  - interns considered too soon as teachers while they are still students;
  - busy schedules (an average of 7.8 hours a day);
  - many students directly coming from secondary schools have a bad command of French;
  - transitions between little compatible sections;
  - theory-practice articulation is difficult in lecture halls.
- Strengths:
  - theory-practice articulation (AFP, internships);
  - closeness between trainers/students and multidisciplinary teams (in options and years) thanks to transition between sections;
  - work on a "teacher identity" (common courses and identical titles between sections);
  - accessibility for many high school graduates.

*AESS: Agrégation* at UCL by Myriam de Kesel and Bernard Tinant

The AESS (*Agrégation* of upper secondary education), organised by a decree of the 8th of February 2001, includes 300 hours of courses and one year of internship. It aims to develop thirteen skills based on four axes: **sociocultural** knowledge; **socio-affective** knowledge; **pedagogic** knowledge associated with a pedagogic approach in two parts (didactic transposition and integrated pedagogic training); **theory-practice articulation** during

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internships. Since the Bologna decree, the pedagogic training can be integrated in the master (didactic orientation). It is thus possible to do a master with a didactic orientation (5 years) or a master with another orientation (or equivalent diploma) followed by 30 AESS credits (6 years).

- Weaknesses:
  - the university has never been vocational;
  - lack of time;
  - activities articulation and lack of coordination within the curricula of masters with a didactic orientation (internships-dissertation);
  - didactic dissertation not always recognised as a “real” dissertation;
  - theory-practice articulation;
  - heterogeneous audience (some in master, others have already worked).
- Strengths:
  - heterogeneity is also an asset; students with different backgrounds bring their experience;
  - one-year diploma for each course of study;
  - major/minor options for some universities; preparation to teach three subjects;
  - collaboration between actors (teachers, inspectors, pedagogic counsellors…).

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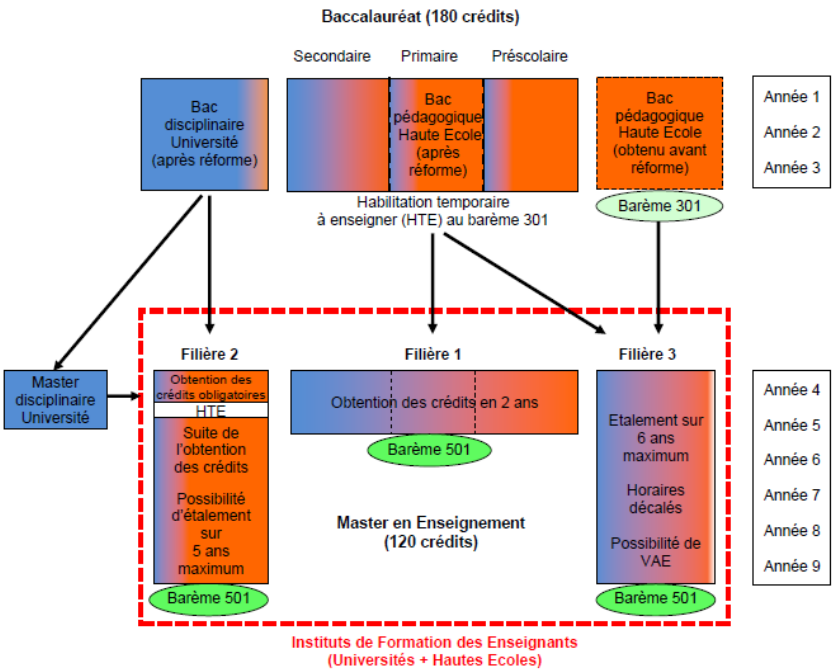
Progress of the reform of teachers' initial training proposed by Jean-Claude Marcourt, Minister of upper education

Figure 1. Parcours de formation des enseignants.




Work on the "Marcourt memo" to rationalise teacher training and create a single institute to train teachers instead of two (university + school), scheduled for 2014. Five priorities for teachers:

- Progressive expertise
- Professionalisation
- Taking root (internship)
- Teachers ready for profession
- Teachers ready for continuing training

**Secondary and upper education chemistry teacher' training:** the European project $EC_2E_2N$-2 project "Chemistry and Engineering Skills for Europe in 2020" (Bernard Leyh, chemistry didactic - University of Liège)

Contribution to secondary teacher training. Associating training in chemistry and in chemical engineering. WP1: excellence in education. This project follows a previous one (EC2E2N - European Chemistry and Chemical Engineering Education Network) on quality in education. The EC2E2N-2 project will develop some results of EC2E2N. 16 countries, 27 members (including the University of Genoa).

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**Length:** 1st October 2012 – 30th September 2015.

**Aims:**

- to create innovative products and processes such as a virtual campus mainly for teachers;
- to facilitate the degree programmes comparability, and hence mobility, across Europe by creating a common database of chemistry and chemical engineering programmes;
- to establish a number of student-centred activities to increase the **attractiveness of chemistry** and enhance European scientific citizenship;
- to **support** and create **ICT-based products** by producing online language courses for chemists and engineers and online materials for chemistry lecturers.

**Some of the results achieved by the project:**

- identification of the best way of collecting and sharing educational material (learning objects) by adopting agreed digital formats;
- an online course: Learning and Training in English;
- internet-based tests of chemistry in a number of different languages at, suitable for high school and university students;
- a database of chemistry and chemical engineering programmes in Europe to aid comparability and mobility.

**Activities:** "*Towards excellence in school teaching*"

i) E-book addressed to teachers focusing on "good practices"
   - Theories of education, teaching and learning in chemistry
   - Classroom experiments and their goals and effects
   - Different methods and media to be used in chemistry classes
   - Taxonomies of learning goals and outcomes

ii) Question Bank "E-Chem-tests" type focusing on the disciplinary, pedagogical and didactic contents

## 4) Section teacher training (publications, comments, synthesis)

Presentation by the partners of the publications and papers on the portal, explanation of forms and reminding of deadlines. Translation in French of texts to comment on.

- **Comment form** (WP3A): review of ICT resources and European partners' publications on teacher training.
- **Portal evaluation** (WP3F): completing the questionnaire.
- **Testimonial form** (WP9A): to complete.

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