

## FRANCE [1] - 2012

### GIVING MEANING TO CROSS-DISCIPLINARY SCIENTIFIC COMPETENCES IN THE LYCÉE

#### A. BASIC INFORMATION

<b>Country:</b>	France
<b>Title of initiative:</b>	[FR] <i>Donner du sens à des compétences scientifiques transdisciplinaires en lycée</i> [EN] Giving meaning to cross-disciplinary scientific competences in the <i>Lycée</i>
<b>Coordinator/ Organization:</b>	Karel Dassonville, Life sciences teacher Lycée Silvia Monfort, 6, rue de l'Orme de Sours, B.P. 9 - 28600 LUISANT
<b>Key competences addressed:</b>	[FR] <i>Compétences de base en sciences</i> [EN] Basic competences in the sciences <ul style="list-style-type: none"> <li>· Associated competences: management of material requirements and procedures</li> <li>· Competences linked to science subjects</li> </ul>
<b>Type of initiative and channels used for implementation</b> (e.g. curriculum reform introduced through legislation etc.)	Reflection within the school related to recent developments in the <i>Lycée</i> curriculum.
<b>Partners:</b>	University of Orléans
<b>Scope:</b> (student/teacher/school level; local/regional/national)	Students and teachers
<b>Learning context:</b> (formal or non-formal)	Formal. Takes place in the context of the introduction of the new curricula for Maths, Physical Sciences, Life and Earth Sciences, and Engineering as part of the 2010-2013 <i>Lycée</i> reform. This experiment allows greater pedagogical freedom within the teaching of exploratory methods (Scientific Methods and Practices, Science and the Laboratory) and in guided personal work (TPE) at Première S level [age 16-17, science option] (future project).
<b>School education level/s:</b> (primary, lower secondary, upper secondary)	Upper secondary

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<b>Target groups:</b>	Currently all students in <i>Seconde</i> year [age 15-16] of the <i>Lycée</i> (280 students) and ultimately all students in the <i>Lycée</i>
<b>Time frame:</b> (start and end date)	2011-2015
<b>Relevant links:</b>	School website: <a href="http://lyc-silvia-monfort-luisant.tice.ac-orleans-tours.fr/eva/">http://lyc-silvia-monfort-luisant.tice.ac-orleans-tours.fr/eva/</a>

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## B. SUMMARY

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The project “Giving meaning to cross-disciplinary scientific competences in the *Lycée*” is a reflection within the *Lycée Silvia Monfort* related to recent developments in the curriculum. The low number of students choosing the science option in *baccalauréat* courses and lower than expected exam results led to a reconsideration of the way sciences are taught within the school.

The project aims to enable students to identify the scientific competences directly usable in all the disciplines of the *Science Pole* of teaching in the *Lycée*: Maths, Physical and Chemical Sciences, Life and Earth Sciences, and (currently to a lesser extent) Engineering Sciences. In the medium term, the project has three objectives: to enable students to advance in all the scientific disciplines by breaking down the barriers separating their knowledge, competences and attitudes; to inspire students to pursue studies and careers in the sciences and to nurture the development of a scientific culture within the school.

This programme is currently being implemented in the *Seconde* level [age 15-16, first year of the *Lycée*]. In 2012-2013 we hope to extend the project to the *Première* level [age 16-17] and then the *Terminale* level [final year of *Lycée*] in 2013-2014, in order to establish a vertical coherence of pedagogical practices throughout the school.

## C. IN DEPTH INFORMATION

### Rationale/contextual background/motivation for introducing the initiative/reform:

There are two identifiable areas of motivation for the reflection on and the implementation of radical changes in science teaching within the school.

Structural Causes: the situation of science teaching within the school, while not worrying per se, has some aspects that deserved deeper reflection. These include the number of *Seconde* students [age 15-16] choosing the science option in *baccalauréat* courses, which remains lower than expected even though no particularly strict selection policy exists. Moreover, although the results in the last scientific baccalauréat session were encouraging, these results have generally been lower than expected.

Immediate causes: the *Lycée* reform (2010-2013) gives teachers an opportunity to reconsider the nature of their profession and especially their own relationship with their discipline and its place among the other scientific disciplines.

For example, the new module “Teaching of Exploratory Methods” in the *Seconde* “Scientific Methods and Practices” class has radically changed the relationship between the three disciplines of Maths, Earth and Life Sciences, and Physical and Chemical Sciences. The fact that three teachers, one from each of these three disciplines, share the same class time, the same students and the same problematics has raised previously unspoken questions, particularly of an epistemological kind, about the nature of the disciplines. Questions about practices, the objectives of teaching and therefore of assessment arose very quickly. The project takes place within the context of the *Lycée* reform and also the context of changes to the curricula of the respective subjects to emphasize thematic approaches.

Furthermore, in the light of the *socle commun des connaissances et des compétences* (common core of knowledge and competences) in lower secondary education, it seemed appropriate to reflect on how this might be taken further in the *Lycée* and to make use of this evaluation tool to develop innovative pedagogical practices.

### Objectives:

The aim is to construct a Science Pole that is clearly identifiable and accessible for all the local actors of the educational system, a process that has been under way since September 2011. This identification must be clear to science teachers, students, families, and the school as a whole.

The project aims to enable students to identify the scientific competences that are directly usable in all disciplines of the Science Pole in the *Lycée*: Maths, Physical and Chemical Sciences, Life and Earth Sciences, and (currently to a lesser extent) Engineering Sciences.

In the medium term, the project has three objectives:

- to enable students to advance in all the scientific disciplines by breaking down the barriers that separate their knowledge, competences and attitudes;
- to inspire students to pursue studies and careers in the sciences;
- to nurture the development of a scientific culture within the school.

**Dimensions targeted by the initiative/reform** (e.g. student curriculum, assessment, initial/in-service teacher education, school autonomy etc.):

With the support of the new curricula, the aim is to set up a system of evaluation through competences based on a corpus common to all the science disciplines. This project will be supported by training – currently undergoing validation – for all science teachers.

**Overall approach** (e.g. holistic – existence of an overarching strategy, or targeted approach focusing on a specific dimension etc.):

The project favours a dynamics of change in pedagogical practices within the school (a complex system with many actors). It has a unifying dimension which could lead to more general changes in the organisation of teaching throughout the school.

**Detailed explanation of the key competence/s concerned:**

**Basic competences in the sciences:**

1. Extract the essential idea of an oral or written text.
2. Understand a statement, an instruction.
3. Answer a question in a complete sentence.
4. Speak in public, in a dialogue, a debate; take into account other people's remarks, argue one's own point of view.
5. Give an account of individual or collective work (presentations, experiments, demonstrations, etc.)

**Associated competences - management of material requirements and procedures:**

6. Follow a protocol using the available materials and software in compliance with safety rules.
7. Take a critical approach to information and its processing.
8. Search for and select required information.

**Competences linked to science subjects:**

9. Know how to formulate a hypothesis (a "conjecture" in Maths)
10. Know how to draw up an experimental protocol.
11. Know how to observe and collect information created by a particular situation.
12. Know how to analyse and interpret data in order to draw up conclusions.
13. Know how to identify subject knowledge.
14. Know how to use subject knowledge.

## Specific subjects concerned or cross-curricular approach:

### Subject-based approaches:

Each teacher will work on certain competences in the corpus. A given competence will therefore be worked on in several areas related to the main disciplines.

### Cross-curricular approaches: the procedure of investigation

Students will be given opportunities to follow up an experiment that has already taken place and to work on research themes involving three scientific disciplines. The aim is to associate the disciplines in a single process of research and evaluation. In Scientific Methods and Practices, the three subjects are brought together to draw up scientific research projects that will lead to the production of a scientific article.

**How the initiative/reform is being implemented** (e.g. process followed, political commitment, consultation with stakeholders and their respective roles, incentives for stakeholders, dedicated funding, teaching material, definition of goals and standards, assessment and evaluation mechanisms, impact on teacher training/professional development and school practices/leadership, scaling-up approach, based on research/evidence? etc.):

### Several initiatives have been set in motion and are currently being pursued:

- establishing a team of teachers for a single division, working on the same body of competences.
- setting up a partnership with the University of Orléans within its EDIFICE structure which aims to support students from *Bac -3* to *Bac +8* [three years before and 8 years after completing the high school baccalauréat].

### Several other initiatives have been carried out during the school year to create a dynamic around the Science Pole

- the Cordées de la réussite programme, all students in *Terminale S* [final year of *Lycée*, Science option] are being introduced to higher education (University of Orléans and preparatory classes [for the grandes écoles] of the *Lycée Pothier*),
- personalised support in *Première S* [age 16-17, Science option], a project enabling every student to help identify the profession they wish to follow.

## Present stage/phase of implementation:

The project is in the consolidation phase with evaluation by competence being carried out and partnerships with higher education institutions being established (University of Orléans and preparatory classes of the *Lycée Marceau* in Chartres).

Other initiatives are under review:

- visits to classes by researchers,
- placements for *Première S* students in research establishments (private or public laboratories, etc.),
- creation of an alumni association for exchanges on training opportunities.

**Pedagogical issues** (issues related to how key competences are being taught to students and how are teachers being prepared to teach them):

No information provided.

**What works well** (to identify enablers):

The school's science teaching staff work well together and show great support for the initiatives we are undertaking; some teams have a long tradition of collaborative work. We are also supported by the school administration.

Finally, the contacts and activities of some teachers facilitate our external relations (University, preparatory classes, CNRS [National Science Research Council]) and contribute to its recognition and reputation at regional level.

**Challenges and how these are being addressed** (to identify obstacles and solutions):

**Difficulties identified:**

- Diffusion of teaching methods
- Moving from the experimental phase with a few classes teachers to a general application of the scheme.
- Giving a clear institutional dimension to the project, in particular through a modification of the modes of evaluation and explaining this to families.

**Addressing the difficulties:**

- A major programme of consultation and dialogue has made it possible to clearly explain the project and pursue its general application.

**Monitoring & evaluation so far/planned, and which methods are being used** (e.g. internal/external quality assurance, inspection, national assessments, international tests, self-evaluation, formative or summative evaluations):

Various indicators will be monitored, in addition to those established in cooperation with the University of Orléans:

- study of changes in numbers of students opting for science-based *baccalauréat* course;
- cross-comparisons of results by competence and by discipline and an evaluation of these;
- studies of the number of students opting for scientific studies post- *baccalauréat*.

Development of student self-assessment.

## Impact (e.g. any planned impact assessment?):

It is hoped that this project will enhance the place of the school in the employment and training environment in which it is located.

- A pole-based structuring of teaching within the school should be initiated through the recognition of the success of the activity of the *Science Pole*; this could mean the creation of a “literary” pole and a “humanities” pole. Pedagogical practices based on competences specific to the poles, but which are multidisciplinary at the same time, would then make it possible to structure and consolidate the students’ journey through the school.

## Communication of the initiative/dissemination of outputs and activities:

### Internal communication:

- consultation and information days (plenary sessions and meetings by pole),
- teaching staff council,
- management board meetings,
- meetings with families,
- local education and training institution meetings (*College-Lycée liaison*).

### Pedagogical communication:

- delegates from the inspectorate,
- structures for monitoring experimentation within the local education authority.
- participation in subject teaching groups
- school web site.

## Next steps/follow-up:

### School year 2012–2013: integration of the project into KeyCoNet, extension into *Première* [penultimate year of *Lycée*].

- The school year 2012-2013 should enable us to extend the project, which has so far been implemented at the *Seconde* level and to establish a vertical coherence of pedagogical practices in *Première S* [Science option] and also in the specific teaching of the sciences in the literary and economic *baccalauréat* options in *Première*.

### School year 2013–2014: extension into *Terminale* [final year of *Lycée*]

- By school year 2013-2014 we should be able to extend the project, which will by then be implemented at the *Seconde* and *Première* levels and to establish vertical coherence of pedagogical practices in *Terminale S* [Science option].

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