

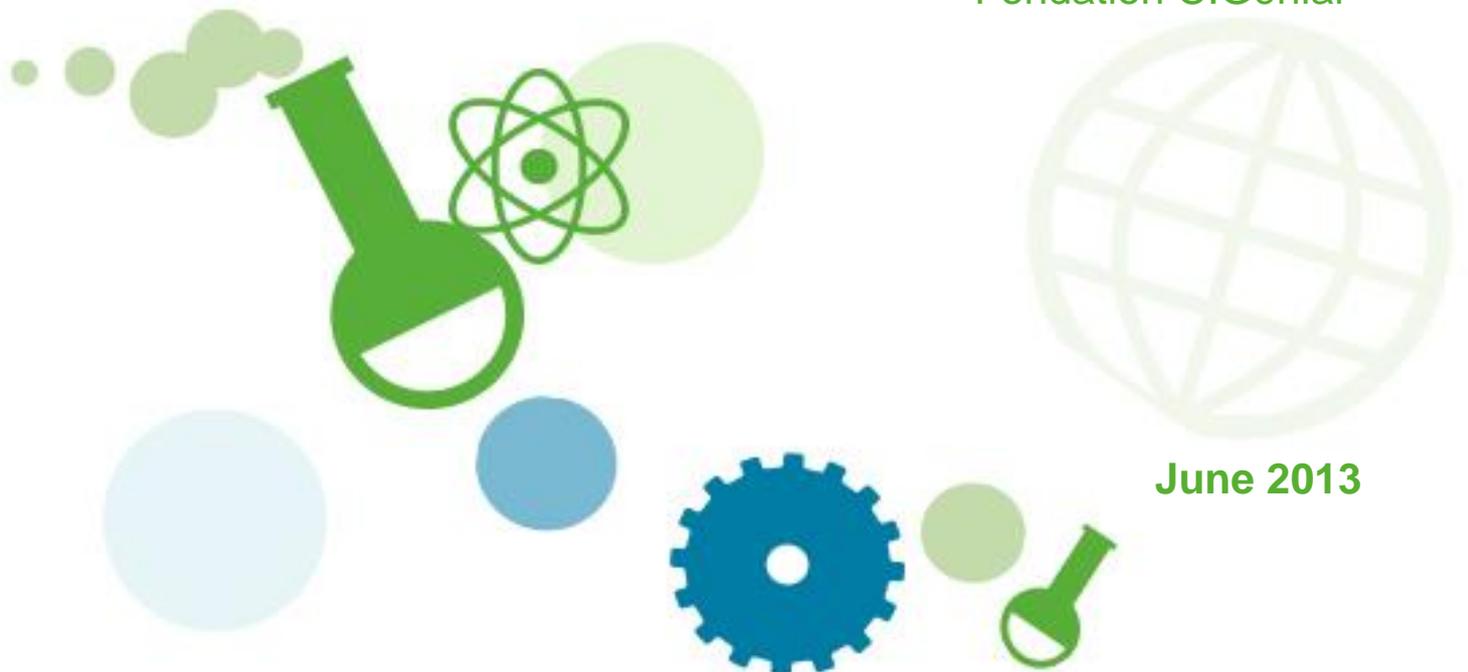


Shaping the future of maths
and science education

School-Industry Cooperation in France

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Fondation C.Génial



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Credits

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INTRODUCTION

1- About this document: an inventory of initiatives in France

As part of the inGenious project and in collaboration with the *Fondation C.Génial*, European Schoolnet is organising a workshop/seminar on school-industry cooperation in science, technology, engineering, and mathematics (STEM).

This report is a supporting document for the workshop and aims to present an inventory of initiatives in France that develop collaboration between the education system (teachers, pupils, schools, etc.) and the world of industry, with the aim of raising young people's awareness of opportunities for study in mathematics, science and technology with a view to making them more attractive.

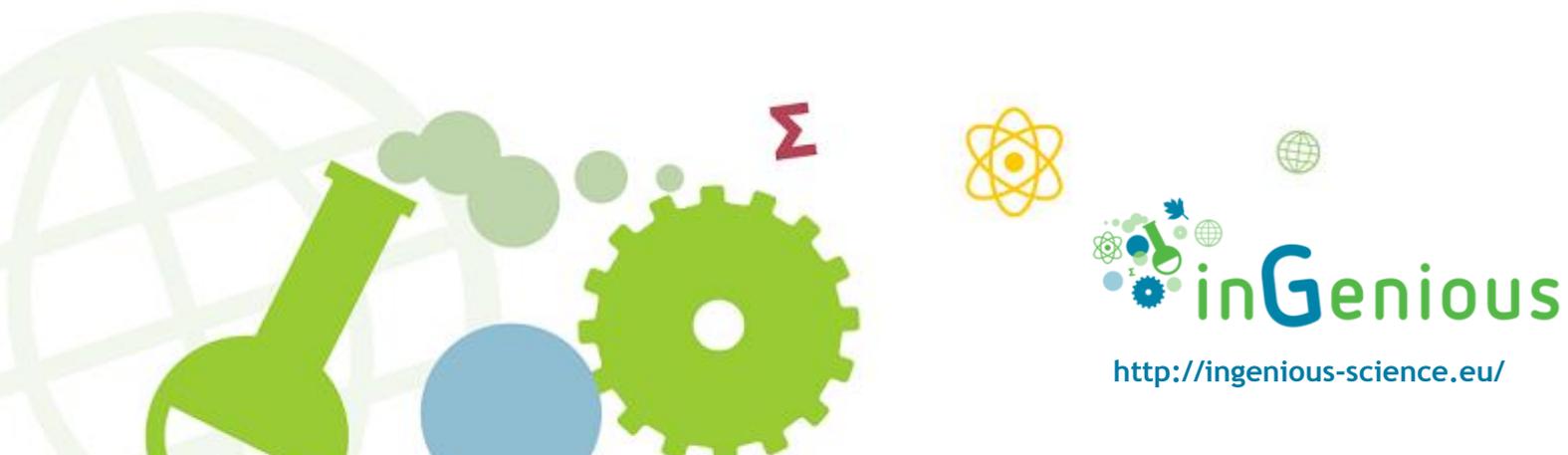
We specifically aimed to identify activities in which companies are directly committed and involved. In addition, we mainly focused on initiatives designed for primary and secondary school students.

The inventory of activities was compiled by means of an online questionnaire:

https://www.surveymonkey.com/s/inG_Practices_FR

This link will remain active for the duration of the inGenious project in order to collect information on initiatives that have not yet been identified.

The task of compiling the list of initiatives was entrusted to the *Fondation C.Génial*, a foundation promoting a scientific and technical culture that was established by six large companies (Areva, Technip, EADS, SNCF, Orange and Schlumberger) with the aim of encouraging young people to take up careers in science.



2- School-industry collaboration: motivations and benefits

Collaboration between education and industry is essentially motivated by:

- The wish to inform young people about careers in science and technology;
- The need to counteract stereotypes and prejudices.

We know that students' career choices (and therefore their choice of studies) are made on the basis of their interest in a particular area and their perception of the employment opportunities that area offers. Positive encounters with science and technology at an early age can have a long-term impact, while a negative experience at school is very prejudicial to future choices.

Teachers are a key factor in shaping career aspirations, as they transmit their vision to their pupils. It is therefore very important for them to be stakeholders in initiatives that are also aimed at them. There is often a disconnection between the curriculum and teachers' perceptions of the real, present-day world of science and scientists. Many teachers are unaware of the range of career prospects that have been opened up by sciences courses. Their knowledge can be updated by collaboration with industry. In this way, school-industry collaboration can make a positive contribution to encouraging students to choose science and technology when the time comes to make a decision regarding their studies.

Involving company employees in this kind of collaboration also brings many further benefits:

- Employers have a lot to gain if their employees take part in this type of activity, since the skills developed through voluntary activities are useful to the company;
- Analyses of employees' perceptions show that such voluntary activities increase their motivation and commitment;
- Collaboration with schools enhances the company's reputation.



3- Inventory of initiatives in France

We used several channels to identify participants in school-industry projects:

- The Ministry of Education provided a list of a number of activities of which it was aware;
- We contacted large companies that are most active in this area (Dassault Systèmes, EADS, Intel, STMicroelectronics) and industry organisations or federations (UIMM, UIC, etc.);
- We approached the Universcience institution (which combines the science museums Palais de la découverte and Cité des sciences et de l'industrie) to find out what they were doing in this area;
- AMCSTI (Association des musées et centres pour le développement de la culture scientifique, technique et industrielle - Association of museums and centres for the development of scientific, technical and industrial culture) took part in the compilation process by distributing the questionnaire within its network, enabling us to include several regional projects;
- Finally, we also listed the projects run by the Fondation C.Génial.

Although the inventory does not claim to present the totality of such activities across the country, these channels enabled us to paint a representative picture of the initiatives taking place in France. As indicated above, the questionnaire remains accessible and this report can continue to evolve right through to the end of the inGenious project.



INITIATIVES IN FRANCE

Some twenty school-industry collaboration initiatives have been identified. They are presented here by **category**.

Almost every project places the **student** at the centre and aims to make her or him an **active stakeholder**. Many of the initiatives invite students to experiment using objects and tools. Only one project, “*Professeurs en entreprise*”, is exclusively for teachers.

Beyond this classification, it is important to note that only eleven of these initiatives are carried out at national level.

In each case, there is a **strong involvement of companies** in preparing for interaction with the educational world. **Teachers** are also **called upon**, since they prepare their classes and monitor their pupils in the case of projects prepared over a full year, in the context of competitions or visits to companies. This point is essential and makes it possible to offer content that is adapted for pupils and meets the needs and objectives of both sides.

Most of the projects are run by teachers or by professionally active employees of the companies.

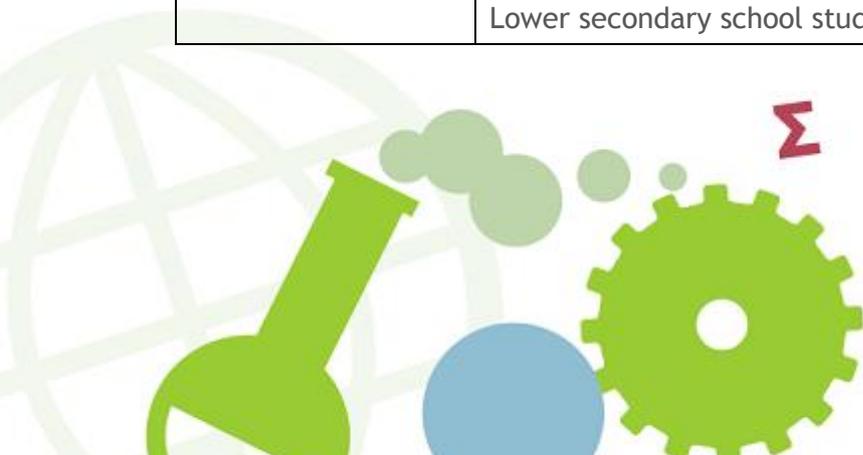
Partnerships and exchanges are carried out from the initial planning stage of the projects through to their completion.



1- Assistance in setting up a project

Name of initiative	“Contrat de partenariat“ (Partnership contract)
Organising structure	UIMM (Union des Industries et des Métiers de la Métallurgie - Metal industries association)
Description of initiative	Setting up partnerships between a class or group of pupils and a company. The pupils visit the company once or several times over the course of the school year to carry out their project. Projects range from the presentation of a profession or the production cycle of a product, to the construction of a metal object. Project presentation days, with a contest and prizes, are organised in many areas of France. About 120 projects involving some 2,000 students are carried out annually.
Scale	National
Target groups	Teachers Lower and upper secondary school students

Name of initiative	“Que faire dans le monde? Un métier!” (What can I do in the world? A career!)
Organising structure	Fondation La main à la pâte, Académie des sciences
Description of initiative	Lower secondary schools and companies combine their competences during the course of the school year in a range of projects that anchor classroom practices in the reality of the professional world (wood industry, aeronautics, greenhouse construction, transport, etc.). These activities are carried out within the framework of the Integrated Teaching of Science and Technology (EIST) initiative of the Académie des sciences, and supported by the Foundation La main à la pâte. Each year, there are ten projects for 300 to 400 students.
Scale	National
Target groups	Teachers Head teachers Lower secondary school students



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Name of initiative	Festival des Sciences et Techniques with the project “Un principe, une entreprise, une manip” (A principle, a company, an experiment)
Organising structure	Terre avenir association (in collaboration with the Aube des Sciences association)
Description of initiative	Classes are linked with a local company to explore a physical, chemical or biological principle used in its processes. Visits, meetings and studies are carried out, followed by a “reconstitution” in the form of a repeatable experiment presented by students to their peers during the festival. Close partnerships are set up with companies, who designate a project officer. In 2012, there were nine stands, representing nine classes (from the first two years of primary school to the first year of upper secondary) and nine companies (Malterie Soufflet, Papeteries Emin Leydier, Voies navigables, SITA Region Est, Serres du Mériot, DDT, Bonduelle traiteur, EDF CNPE, SAIPOL), who conceived, produced and presented a joint project (presentation given by students).
Scale	Local (one town: Nogent-sur-Seine)
Target groups	Teachers Primary and secondary school students

Name of initiative	“Eurêkart”
Organising structure	Michelin
Description of initiative	Creating a technological object through a scientific challenge in partnership with a local company. By taking part, through exchanges, in a research community and working in a team, students acquire knowledge and know-how in science and technology.
Scale	Local (metropolitan area of Clermont-Ferrand)
Target groups	Teachers Primary and secondary school students



2- Competitions

Name of initiative	“Course en cours” (Classroom racing)
Organising structure	Course en cours association , financed by Dassault Systèmes and Renault
Description of initiative	This nationwide project for educational success is an interdisciplinary educational structure centred on the fields of science and technology, devised by Dassault Systèmes and the University of Versailles Saint-Quentin en Yvelines in 2005. The project, run annually, is aimed at secondary school students who compete to race miniature vehicles designed and manufactured using software (CATIA) and techniques (wind tunnels) identical to those used in industry. 11,000 students take part each year, tutored by higher education students, a structure that has earned the project several Cordées de la Réussite labels. The competition combines numerous scientific activities with artistic work (design a graphic identity, a stand), marketing (finding sponsors), communication and languages (the project is presented to the judges in English). The project has received many awards, including the 2009 “Creativity and Innovation” prize.
Scale	National
Target groups	Teachers Lower and upper secondary school students Students in vocational and technical training schools University students

Name of initiative	“Imaginons le transport du futur” (Imagining the transport of the future)
Organising structure	Fondation EADS
Description of initiative	A competition open every year to 24 lower secondary school classes (years 1-3). The classes are from schools of the education authorities in whose areas the EADS Group has facilities (Aix-Marseille, Bordeaux, Créteil, Nantes, Toulouse, Versailles). To support them in their project, students are supervised by the teaching team of their class and put in contact with representatives of the world of industry. These



	“EADS Ambassadors” are employees of the EADS Group (EADS, Airbus, Eurocopter, Astrium, Cassidian) and they give a presentation to students on their profession and their career path, and also talk about the range of scientific and technical careers available within the Group. They also welcome each participating class when it visits sites and may offer help in the completion of the project.
Scale	National, covering six education authorities (Aix-Marseille, Bordeaux, Créteil, Nantes, Toulouse, Versailles)
Target groups	Lower secondary school students

Name of initiative	“Concours C.Génial” (C.Génial Competition)
Organising structure	Ministry of Education’s “Science in Schools” team in partnership with the Fondation C.Génial
Description of initiative	This competition enables secondary school students to present an innovative project relating to science and technology. Students are expected to demonstrate an equal and significant use of the various science and technology disciplines (physics-chemistry, mathematics, technology, life and earth sciences) while carrying out a scientific project. Priority is given to projects developed in partnership with the world of science and science-based companies in particular. The collaboration can take the form of methodological support (e.g. in devising an experimental model, material or software support, information exchange, transfer of competences, etc.). The best projects in each education authority are selected and a national final is then held; winners are awarded prizes, notably in the form of company visits (Schlumberger, Areva, Technip, Saint-Gobain, BASF, Total, Michelin, Asconit).
Scale	National
Target groups	Teachers Lower and upper secondary school students Students in vocational and technical training schools



Name of initiative	“Concours de l’innovation” (Innovation Cup)
Organising structure	STMicroelectronics in France
Description of initiative	Teachers are invited to take part in this competition with their classes. The aim is to create an innovative product of interest to a manufacturer. This can be part of an innovation competition organised by a manufacturer or be on a specific theme (e.g. from 2010: “Making life simpler and better”). The three best proposals are awarded prizes funded by companies.
Scale	Local
Target groups	Pupils and students from primary school to higher education

There are many scientific competitions in France; those mentioned above are the ones for which we identified a link with companies (other than financing). It is, however, important to mention other major competitions such as the *Olympiades de Physique France*, the *Olympiades de Sciences de l’Ingénieur*, the *Olympiades de Géosciences*, the *Olympiades nationales de la Chimie* or the *Faites de la Science* competition. An initial document listing all the competitions in France is available on the website of the *Olympiades de Physique*: http://www.odpf.org/pdf/repertoire_des_concours.pdf

3- Women and science

Name of initiative	“Club des lycées” (Lycée club)
Organising structure	Elles bougent association
Description of initiative	Upper secondary schools (lycées) are invited to become partners of the Elles bougent association, enabling them to pass on a passion for science to their female students and to encourage young women to aim for careers in engineering and technology. The Elles bougent network is made up of companies, “godmothers”, and young women in upper secondary and higher education. Throughout the year, members contribute through activities that promote careers in industrial technology for women. Partner schools undertake to inform their pupils about activities and events held by the association and to encourage meetings between “godmothers” and students. They make



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	it easier for their students to attend Elles bougent events by acting as a representative of the association in their region or by making various other contributions towards achieving the determined aim. With the help of its partner schools, Elles bougent works towards bringing the world of education and the world of industry closer together, by facilitating meetings between “godmothers” in industry and partner institutions and young women in education.
Scale	National
Target groups	Upper secondary school students

Name of initiative	“Actions in milieu scolaire” (Action in schools)
Organising structure	Femmes et sciences association in partnership with the Femmes et mathématiques and Femmes Ingénieurs associations
Description of initiative	The members of these three associations hold many local meetings in which they meet young people (boys and girls) to pass on their enthusiasm for their professions.
Scale	National (in particular the Île-de-France, Alsace, Midi-Pyrénées and Rhône-Alpes regions)
Target groups	Lower and upper secondary school students

Name of initiative	“Les filles, osez les sciences!” (Girls, dare to do science!)
Organising structure	Femmes et Sciences 53 association
Description of initiative	<p>The “Les filles, osez les sciences!” project aims to raise awareness among all young people about careers in science and technology, and to combat gender stereotypes in order to encourage young women in particular to choose such careers. The project consists of:</p> <ul style="list-style-type: none"> - A travelling exhibition, “Les filles, osez les sciences”, which tours secondary schools in the département (Mayenne); - Classroom presentations by female professionals or students (especially volunteers speaking on their own behalf, not for



	<p>their companies);</p> <ul style="list-style-type: none"> - Company visits by small school groups (the only company that the association is working with directly at present is Thalès, which has been “Equality” certified and has a demonstrated commitment to the cause of women in science, organising classroom talks and site visits. Thalès is looking into developing partnerships with other local companies and two companies (AIM and Emaplast) have expressed interest); - A thematic day-long event on occupational equality: students meet women working in six areas in which they are generally under-represented (manufacturing, construction, entrepreneurship, agriculture, transport, science & technology).
Scale	Local (one département: Mayenne)
Target groups	<p>Teachers</p> <p>Head teachers</p> <p>Lower and upper secondary school students</p> <p>Adults who have contact with secondary school students (parents, teachers, etc.)</p>

Name of initiative	“Déployons nos Elles” (Spreading our Wings/Using our Shes)
Organising structure	IMS entreprendre pour la Cité association, with strong partnership from Intel
Description of initiative	This programme, whose aim of is to present “men’s jobs” to young women, is organised in partnership with 30 companies and 40 lower secondary schools in France (in the Ile-de-France, Pays de la Loire and Rhône-Alpes regions). Female crane operators, finance directors, software developers, etc. meet school students to talk about their careers in typically male occupations. These discussions help to combat the stereotypes that girls may have about such jobs. Furthermore, they are accompanied by male colleagues in order to help boys also change their opinions on the presence of women in certain occupations.
Scale	Local (three regions: Ile-de-France, Pays de la Loire and Rhône-Alpes)



Target groups	Teachers Lower secondary school students
Notes	Intel is the main partner and IBM collaborates with IMS entreprendre pour la Cité, which liaises with the Ministry of Education. These activities are held as part of the Corporate Social Responsibility of the Intel Corporation. Its scope is not limited to science and technology.

4- Classroom meetings

Name of initiative	“Ingénieurs and techniciens dans les classes” (Engineers and technicians in the classroom)
Organising structure	Fondation C.Génial
Description of initiative	Engineers and technicians come into secondary school classrooms to talk about their careers and present their companies and their everyday work. This encounter provides students with an example of a particular engineering career and helps them in their choice of studies.
Scale	National
Target groups	Lower and upper secondary school students
Notes	To cover the whole of France, the Fondation C.Génial is supported by regional partners: OPE in the Lyon area, Terre des Sciences in Anjou, Exploradôme in Val-de-Marne, Sciences animation in Toulouse and Terre avenir in Seine-et-Marne. The Animath association runs a similar initiative in collaboration with the Société de Mathématiques Appliquées et Industrielles, the Fondation C.Génial and Texas Instruments. This project is called “Les maths, ça sert!” (Maths is useful!) and is run in Ile-de-France and around Nice and Toulouse.



Name of initiative	“Les présentations chimie” (Chemistry presentations)
Organising structure	UIC (Union des Industries Chimiques - Chemical Industries Association)
Description of initiative	Depending on local conditions (human and material resources, etc.), the initiative mainly involves events in schools in the form of forums or lectures. The lecturer (a current or retired employee of the company) sets up a dialogue with students (secondary school) with the aid of various media and tools (CD-ROM, teaching pack with eight experiments, films, etc.). After the ensuing discussion, the lecturer presents the chemical industry and its specialist branches, giving concrete examples from his/her professional experience.
Scale	National
Target groups	Lower and upper secondary school students

5- Visits to companies

Name of initiative	“Professeurs en entreprises” (Teachers in companies)
Organising structure	Fondation C.Génial in partnership with the Terre des Sciences association (Pays de la Loire)
Description of initiative	Invites secondary teachers to meet engineers and researchers in companies: guided visits to sites using cutting-edge technologies and small group discussions led by high-level scientists. The initiative takes place every year in November on three or four dates depending on the school calendar (mainly on Wednesday afternoons). In 2012, 63 industrial research or production sites welcomed more than 600 teachers, head teachers, careers advisers, and subject leaders all over France.
Scale	National (19 education authorities)



Target groups	Teachers Head teachers Careers and course advisers
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Name of initiative	“Parcours Découverte” (Discovery trail)
Organising structure	An initiative by the Picardie Region in collaboration with the Ombelliscience association.
Description of initiative	These educational discovery trails take place during the school year, in three stages: Preparation of students; High point with a visit and meeting; Students report back.
Scale	Local (one region: Picardie)
Target groups	Teachers Upper secondary school students Students in vocational and technical training schools

Name of initiative	“Visites d’entreprises” (Company visits)
Organising structure	Cap Sciences association
Description of initiative	Within the programme Côté sciences Air & Espace, a strong partnership has been developed with local companies in the aeronautics and aerospace sector. This programme also supports school projects (from primary to upper secondary). Cap Sciences brings together the different groups involved in the programme (school and industry) in order to enable them to get to know one another, and organises site visits where students and teachers can discover a real professional environment.



Scale	Local (one city: Bordeaux)
Target groups	Lower and upper secondary school students Students in vocational and technical training schools

Name of initiative	“Ecole du végétal®” (Plant school)
Organising structure	Terre des Sciences association
Description of initiative	This initiative was set up together with the competitive cluster Végépolys, in the Pays de la Loire, at the request of and with the collaboration of teachers. The initiative aims to develop pathways to help pupils and students to learn about companies, laboratories, jobs and training, enabling them to access vocationally relevant training opportunities. The participating institutions are: INRA, Agrocampus Ouest (engineering school), the University of Angers, Groupe d’Etudes et de contrôle des Variétés et des Semences (GEVES - Variety and Seed Study and Control Group), and dozens of companies in the Pays de la Loire. This activity has been developed over the last twenty years and took on a new dimension in 2012 with the support of the regional project Parcours de réussite des jeunes ligériens avec les sciences et technologies, backed by Investissement d’avenir.
Scale	Local (one region: Pays de la Loire)
Target groups	Teachers Head teachers Lower and upper secondary school students Students in vocational and technical training schools University students

Name of initiative	“Décode la Science et le développement durable” (Decode science and sustainable development)
Organising	Terre avenir association



structure	
Description of initiative	Setting up events in educational institutions (primary and secondary schools) on one of three themes: water, energy or climate. These events are organised by the association but may also involve researchers or engineers specialising in these areas. Workshops with experiments are offered for younger pupils, and debates or meetings with researchers are held for upper secondary pupils. Visits to companies or laboratories related are offered in the second stage of the initiative. These visits are related to the theme in question (wind farm, power station, pumping plant, environmental consultancy, etc.). The partner companies are: EDF, Météo France, TOTAL, VEOLIA, SOFIPROTEOL, Eau de Paris.
Scale	Local (two départements: Seine-et-Marne and Essonne)
Target groups	Teachers Head teachers Careers and course advisers School librarians Primary and secondary school students Students in vocational and technical training schools
Notes	On-going project that has been running since the start of the 2012-13 school year. In the provisional calendar, talks in schools and company or lab visits are planned from December 2012 to June 2013.

Two other projects offer the opportunity to discover professions within companies by visiting sites, but they are not concerned only with science and technology.

One is *Un jour, un métier* (One day, one profession) which gives 3rd-year lower secondary school students from disadvantaged areas the chance to discover various professional worlds (within the scope of the *Découverte Professionnelle* [Career Discovery] module). Meetings within this project take place in the Ile-de-France, Rhône Alpes, and Provence Alpes Côte d'Azur regions. We were informed of this project by Intel, because IBM collaborates with *IMS entreprendre pour la Cité*, an association liaising with the educational world, as part of its Corporate Social Responsibility programme.



The association *Terre des Sciences* in Angers gives secondary schools in the Pays de la Loire region the opportunity to discover local laboratories or companies. Another initiative, “**Made in Angers**”, part of the industrial tourism programme organised by the Angers Loire municipality, also invites them to visit local companies.



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6- Other original initiatives

Name of initiative	“Classe en entreprise” (The class in the company)
Organising structure	UIMM (Union des Industries et des Métiers de la Métallurgie - Union of Metal Industries and Professions) and the FIEEC (Fédération des Industries Electriques, Electroniques et de Communication - Federation of Electrical, Electronics and Communications Industries)
Description of initiative	This project, which has been running as a pilot project since March 2009, is now being rolled out nationally. The principle is that a class moves into the premises of a company, with a meeting room serving as a classroom, in order to develop an awareness of the reality of working life and enabling the class to immerse itself in the life of the company. Following a structured teaching methodology, students gain a positive, concrete view of the company, the jobs done within it and the people involved. Lessons proceed as normal (the teachers come to the premises) except that four one-hour teaching periods are replaced by four sessions devoted to discovering professions. The principle can be adapted according to the site and to teachers' needs. In 2012, between 50 and 60 companies (with between 100 and several thousand employees) took part.
Scale	National
Target groups	Lower and upper secondary school students Students in vocational and technical training schools

Name of initiative	“High Tech U”
Organising structure	STMicroelectronics in France via the Fondation SEMI
Description of initiative	For three days, students in the first year of upper secondary school (36 in each session) discover various jobs or principles in microelectronics through educational games at the sites of ST Crolles, SOITEC and Grenoble INP. Between 2007 and the end of 2013, 13 sessions will have taken place, including three in 2013. This project is aimed particularly at girls.
Scale	Local (one département: Isère)
Target group	Upper secondary school students



Name of initiative	“Science et technique des métiers pour tous” (Career science and technology for all)
Organising structure	Science Animation Midi-Pyrénées
Description of initiative	Explaining to students the history, from design to production, of scientific and technical objects that are used every day (e.g. aeroplane hatches or anti-cancer drugs), by presenting the jobs, training and careers of the various people who contributed to the development of the objects. The project is carried out in two stages: firstly a mediator from the science centre gives a talk to the class after which he/she accompanies the students on a company visit.
Scale	Local (one region: Midi-Pyrénées)
Target groups	Upper secondary school students
Note	The project is being developed and the call for applications was sent to all upper secondary schools in the region (with priority given to Toulouse, and the départements of Lot and Tarn) after the February 2013 half-term break.

Name of initiative	“WET Académique”
Organising structure	Nestlé Waters in partnership with the association La Vigie de l’Eau
Description of initiative	WET (Water Education for Teachers) is an international water education programme. In partnership with Nestlé Waters, educational workshops aimed at primary school pupils are held every year, providing a day of events designed to raise awareness about issues related to water. La Vigie de l’eau receives the pupils on its premises and prepares the workshops together with the Nestlé employees who run the day’s activities. Ten classes attended the 2012 workshop and another ten attended the workshop held on 4 April 2013.
Scale	National (four bottling plants)
Target groups	Primary school students aged 8-11



OTHER INITIATIVES

When compiling the inventory of school-industry collaboration for the inGenious project, we received details of many other projects that are less directly related to school-industry collaboration but which aim to raise young people's awareness of sciences and technology and related careers. Here we briefly present these other initiatives, organised by category.

1- Festivals and events

Many major scientific events in France also offer activities aimed at school students.

The *Fête de la science* (Science Fair), which has been held every year since 1991, is overseen by the Ministry of Higher Education and Research. Every October there are five days of exchanges between the scientific community and the public in events, exhibitions and debates throughout France. The next session will run from 9 to 13 October 2013.

For further information see: <http://www.fetedelascience.fr>.

The third *Semaine de l'industrie* (Industry Week) took place from 18-24 March 2013. In 2012, over half of the events in this project were made up by visits to companies and open days, the other half consisting of lectures, visits to schools, presentations and practical workshops, career forums, exhibitions, etc.

For further information see: <http://www.redressement-productif.gouv.fr/semaine-industrie>.

The 2013 *Semaine du développement durable* (Sustainable Development Week), with the theme of Energy Transition, was held from 1-7 April. For example, the *Terre avenir* association, took part in this event in 2012, inviting school students to meet science ambassadors who presented the aims, expertise and career opportunities of the partners present, and the ways in which biodiversity (the 2012 theme) was taken into account in those professions.



For further information on the 2013 event see: <http://www.agissons.developpement-durable.gouv.fr>.

At a more local level, the Picardie region organises the *Printemps de l'Industrie* (Industry Spring)., This initiative is run by the regional council in partnership with the Ministry of Education, industry associations, Chambers of Commerce and Industry, and the *Ombelliscience Picardie* association. The eighth edition of the event took place from 14 March to 7 April 2013. In this project school students are invited to visit 89 different companies and the event is also supported by pedagogical projects with upper secondary schools that run for a whole school year. This year, seven projects were carried out, with the support of representatives from companies who first gave a classroom talk and then invited the students to visit their site.

For further information see: <http://www.printemps-industrie.picardie.fr/>.

2- Exhibitions by (or in partnership with) companies

Other bodies have developed exhibitions and workshops to introduce and promote scientific occupations in industry. Here are two examples:

One is **Propulsion Tour**, organised by the UIMM, which offers students in lower secondary schools (upper years) and upper secondary schools interactive modules related to the world of industry, presenting the economic, social and environmental issues that industries respond to. Two caravans tour the country to meet students, their teachers and the general public. One presents an exhibition with 3D illustrations on *La Cité industrielle* (The World of Industry) and the other invites young people to take part in the game “Drive for success”, in which they construct a vehicle in a virtual workshop.

For further information see:

<http://www.les-industries-technologiques.fr/actualite/dcouvrez-les-mtiers-de-lindustrie-en-vous-amusant>.

The *Visiatome* at Marcoule is a science museum that holds educational science workshops, mainly on the topic of energy. The museum is owned by the French Atomic Energy and one



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of the partners is AREVA, which contributed greatly to the design of the permanent exhibition.

For further information visit the museum's website: <http://www.visiatome.fr>.

3- Resources and teaching packs

There are also some projects that give information on careers and courses to help students and teachers.

The UIC has recently developed the website www.lesmetiersdelachimie.com to demonstrate the role of chemistry in everyday life and to inform young people about how they can get involved and “change tomorrow's world” through a career in this sector.

Since January 2013, the UIMM has offered an **educational pack** for teachers to help them prepare classes on industrial topics. The pack can be downloaded from: <http://www.les-industries-technologiques.fr/enseignants>.

4- Games

Online games that help to add an element of fun into science teaching and to show the concrete applications of science in the world are also available.

The WeWantToKnow company offers **DragonBox**, a serious game designed for use by teachers in the classroom to help in teaching algebra. It is now the subject of academic research on school teaching in the USA, by the Center for Games Sciences. Several classroom tests have been carried out in Oslo, Norway.

For further information see: <http://dragonboxapp.com>.

The UIC offers two online games for primary and secondary school students. **Super Kimy** is for ages 7-11 year olds (www.superkimy.com). **Projet MC²** (www.projetm2c.com), A serious game aimed at students aged 13-18, presents the chemical industry from the inside.



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5- Science entrepreneurship

This last category is worthy of mention because it shows students that studying science can also lead to them setting up their own companies.

At the *Fête de la science* in 2012 and in partnership with the *100,000 Entrepreneurs* association, **Universcience** organised **speed-meetings** between eight entrepreneurs and two classes from the Lycée Jules Siegfried in Paris (students aged 16-17, studying STMG - Sciences and Technologies of Management). For two hours, professionals spoke with students about the realities of business and their own entrepreneurial experience. Run for the first time in 2012, this event aimed to present entrepreneurship and careers in science and technology; it is likely to be held again with a greater emphasis on science and technology.

The *Fondation C.Génial* awarded the **C.Ingénieux Prize** for the first time in 2011. The aim of the prize is to encourage young people's technical and scientific entrepreneurship by highlighting and rewarding a young entrepreneur who is judged to be a successful role model. The winner receives a prize in recognition of his/her personal commitment in the creation of an innovative science and technology-related enterprise.

For more information see: http://www.cgenial.org/?c=Prix_C.Ingenieux_266.



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DIFFICULTIES ENCOUNTERED

Through the questionnaires we identified a certain number of difficulties in setting up and implementing initiatives:

1- Mobilising and recruiting schools and companies

The long-term effectiveness of these activities requires strongly committed partners. This point comes up frequently as a major difficulty for many projects, although the people we contacted also regarded it as a motivating challenge. The points below give some examples:

- In the “Professeurs en entreprises” initiative, run by the Fondation C.Génial and requiring teachers to contribute their own time, it has proven difficult to find participants and to know whether those who do enrol will actually attend. The Fondation EADS expresses a similar concern with the “Imaginons le transport du futur” initiative, in terms of finding classes who will take part.
- Several people mentioned the difficulty of making their projects known to teachers, among whom information does not readily circulate.
- The Sciences et femmes 53 association has had the opposite problem, with difficulties in finding partner companies to pilot activities in their region.
- To counter the difficulty of contacting schools, Intel has chosen to work through an association (IMS Entreprendre pour la Cité) to organise its initiatives with the Ministry of Education (“Déployons nos Elles” and “Un jour, un métier”).
- Even with some long-standing initiatives, we detected some frustration among participants. Regarding its partnership contracts the UIMM reports, “We set up these contracts twenty years ago, and some schools and companies have ceased to participate. It has to be said that school-industry relations have developed greatly in the last twenty years; schools receive many more offers and want to vary the topics. Moreover, we ask our companies to get involved in many other projects. The



introduction of DP31 has led to a significant reduction in the number of contracts; teachers no longer want to commit themselves to just one project in one sector.”

In general, project organisers sense a certain distance and lack of investment on the part of the Ministry of Education.

2- Financing

Most projects are supported by structures or associations that report a lack of means (subsidies) to design and implement their initiatives. Several say that finding partners to finance these activities is complicated.

Project expenses include transport and are sometimes difficult to cover, especially when a whole class or several classes have to travel.

3- Coordination between the two sides

Beyond project financing, meetings between schools and companies can be complicated by the need to coordinate two different calendars and rhythms, with projects needing to be included in an annual timetable that is already very full.

Cap Sciences in Bordeaux, which organises company visits, highlights this fact, stating that the constraints of both sides have to be taken into account. *Exploradôme* even adds that implementation is sometimes difficult because of the number of intermediaries on the company side as well as the problem of matching the school and company calendars. The *Terre avenir* association also highlights long delays arising from the need to get projects approved on both sides and from their practical implementation (especially the scheduling problem).

¹ *Découverte Professionnelle en 3^{ème}*: a career discovery module that is now available in the final year of lower secondary school.



4- Geographical restrictions

Some initiatives depend on the geographical location of the company and can only be undertaken with schools in the neighbourhood, excluding many others.



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PRELIMINARY RECOMMENDATIONS

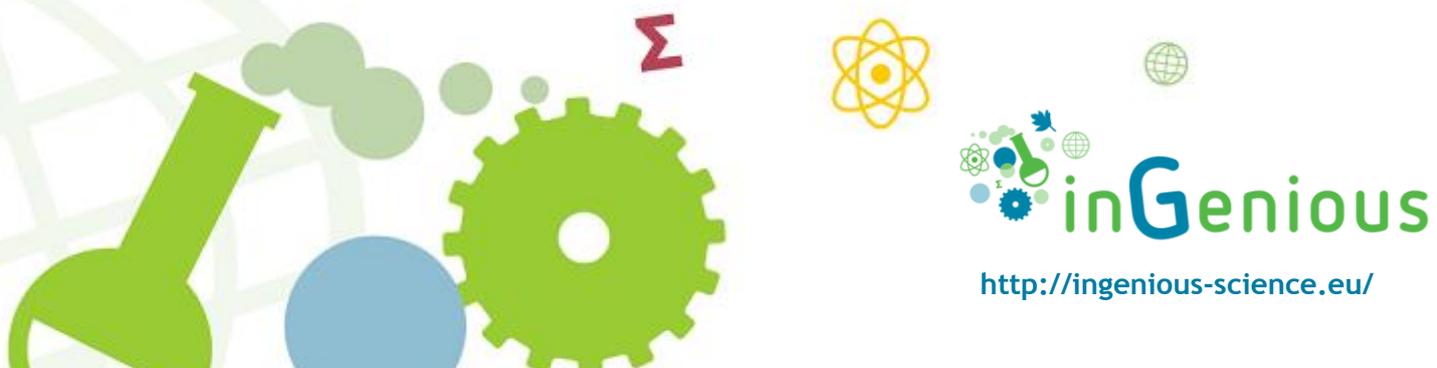
1- Recommendations for and relating to companies

In general, companies do not have a great deal of time to devote to activities that are not part of their production process. Moreover, most of them find it easier to deal with students of scientific or technological subjects in higher education who understand the language of the professionals and can be hired on short-term contracts.

To facilitate the development of initiatives at all levels of education, several pathways can be explored:

- The initiatives offered should **not take up too much time** (a maximum of 2-3 days per year and per employee²) and not disrupt the life of the company. We have also observed that initiatives that can take place at any time in the year, according to the schedule of the company representative, are a real advantage (as opposed to events with fixed dates).
- The activities proposed to companies should, where possible, be “**ready for use**” and easy to repeat. The user should be provided with all the tools and information needed for delivery of the project. At the same time, activities should remain adaptable depending on the participant, but the time spent on preparation and implementation should be minimal.
- Companies may also choose to contribute to a project by **delegating it to an association**. Even if this association is made up of employees of the company, they work on it outside their working hours and the company can continue to operate normally.
- It is important to **communicate persuasively** and to devote more resources to such initiatives. Presenting “**success stories**” of initiatives that are working and growing

² We give this figure on the basis of our experience. It would be useful to know more precisely how much of their employees' time companies are prepared to “give” for such activities. It should be noted that in the “America 2020” project, the government invites innovative companies to participate at the rate of 20 hours per year per employee.



can encourage other companies to join in. Testimonies from companies and employees can be an incentive to others.

- School-industry collaboration can be part of a company's **Corporate Social and Environmental Responsibility** practices. This can be useful leverage in the development of such activities.

2- Recommendations for teachers and the Ministry of Education

Like companies, teachers have little spare time to devote to preparing these activities, which in some cases are outside the curriculum and the timetable. Thought therefore has to be given on how these exchanges with companies can be facilitated and developed:

- **Incorporating these initiatives into school curricula.**
- Encouraging head teachers to give more prominence to these initiatives and **writing them into the school mission statement.**
- Involving teachers in collaborative projects with industry should be recognised as a **professional skill** and teachers' professional development should include the acquisition of such competences.
- It is also necessary to **value teachers' commitment** in such activities with more recognition and rewards. The support of school administrations is indispensable. Rewards such as those offered in the C.Génial competition (accompanying students to national finals or a company visit with them) are gestures that will encourage teachers to participate.
- Teachers should be able to rely on the support of a **coordinator** responsible for finding partner companies and dealing with the administrative aspects of such projects, relieving the teacher of paperwork so that he/she can concentrate on the project itself.
- Since the start of the 2012 school year, every education authority has **Correspondants Académiques Sciences et Technologie** (CAST - Education Authority Science and Technology Officers) who are responsible for coordinating activities promoting a scientific culture. Their role should be more precisely defined and should include advising and supporting teachers in setting up school-industry partnerships.



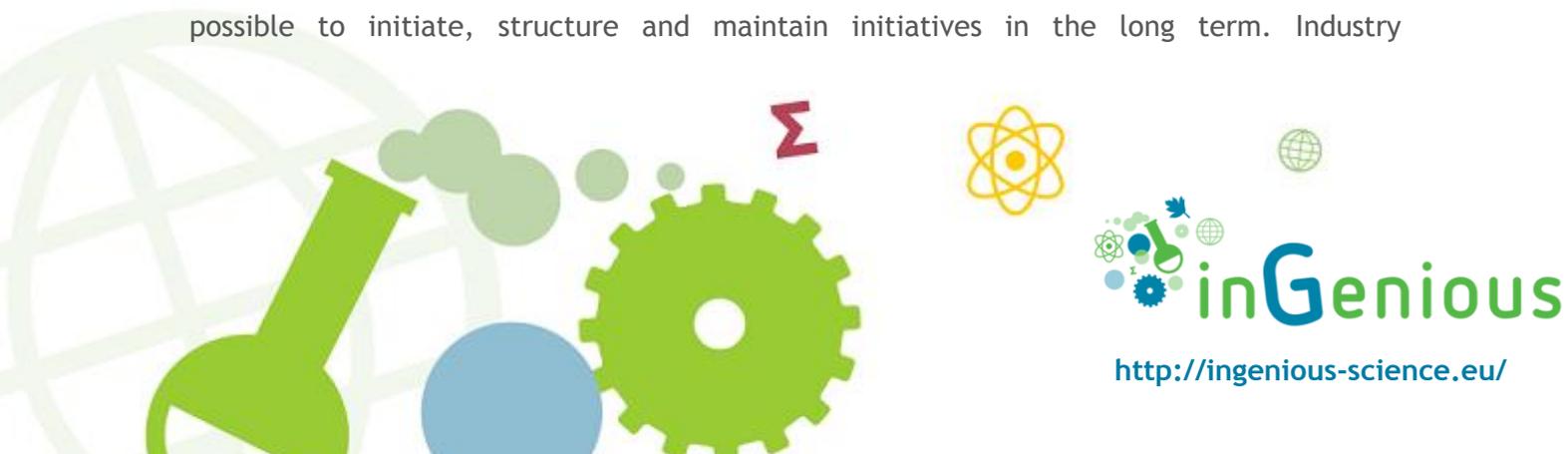
3- Developing organisations to facilitate school-industry dialogue

Most of the barriers encountered lie in the complexity of collaboration and the additional effort required from both schools and companies. It has to be taken into account that, although each side can see what it has to gain from collaboration, the main objectives of the two sides are different.

Organisations whose mission is to facilitate and encourage relations between schools and industry play a crucial role in supporting this collaboration. They may be public or private or a combination of the two. This is how they add value:

- **Facilitating connections:** these organisations enable a more structured cooperation to take place between companies and schools, avoiding individual discussions and facilitating dialogue between the different parties. They also act as moderators and facilitators and can resolve some difficulties facing schools, e.g. finding time to approach companies and knowing what language to adopt.
- **Broadening the scope:** in many cases it is easier for these organisations to organise events on a national scale than it is for a company on its own. National events mean that a larger number of schools (and therefore students) can be reached.
- **Variety of content:** because these organisations have links with many companies, they can offer schools a greater variety of content.
- **Neutrality:** in France, school-industry relations are regarded with scepticism. The fact that this type of collaboration is offered, for example, by a group of companies via a foundation facilitates the setting-up of partnerships.
- **Long-term commitment:** school-industry collaboration is often fragile, especially when it depends on the relationship between two people. The existence of an organisation supporting the partnership helps to maintain long-term collaboration.
- **Recruitment:** an organisation that brings together several companies can more easily recruit new companies to cooperate with the Ministry of Education because they have shared objectives.

There are several organisations of this type in France: the *Fondation La main à la pâte* and the *Fondation C.Génial* are two examples. Their role is to develop activities that make it possible to initiate, structure and maintain initiatives in the long term. Industry



organisations (e.g. UIMM, UIC) are also strong advocates for promoting careers in science and technology.

In terms of stakeholders of the scientific culture, a number of science and technology centres (CCSTI) and associations play a very important role in developing activities in the regions, as we have seen in the study. It has to be noted, however, that their role in developing school-industry initiatives remains marginal compared to the range of activities promoting scientific culture that they carry out (exhibitions, science and society debates, educational events, etc.).

There is also the “*Ingénieurs pour l’École*” (IPE, Engineers for Schools) project, which links companies to the Ministry of Education. Engineers are seconded to the Ministry for periods of one to three years, renewable once. Setting up school-industry activities could be made part of their remit.

The fact remains that these organisations are as yet not sufficiently developed to generate all of the benefits mentioned above. For example, none of them brings together a large enough number of companies to be able to present a varied offer to schools throughout France. It should also be noted that most of the organisations are fairly young and still developing.

It would be a definite advantage for the country if the various stakeholders were more coordinated in order to be able to put forward a more varied offer over a larger area of the country. This raises the question of how to create a **national platform** to coordinate them.

4- Are new initiatives needed?

Our inventory of initiatives in France has shown us that there is no lack of ideas and proposals. Rather than calling for new initiatives, the approach should therefore be to say: “Let us build on what exists by expanding the presence of the most relevant of the existing initiatives to the whole of France.”

Nonetheless, we note that:



- None of the initiatives listed offers activities related to work placements for pupils in 3ème [age 14/15]. These placements currently function more like “industry tourism” but could, if better organised, be an opportunity for an in-depth discovery of applied science and technology.
- Existing activities should be enhanced by making full use of digital technologies and offering online tools.

5- Evaluation

The importance of evaluation should not be neglected even if it is not easy to set up. Through evaluation, content can be improved and adapted to specific needs. Evaluation generally takes the form of questionnaires on levels of satisfaction.

It can be observed that teachers do not systematically review completed activities, and few remarks are made with a view to improving projects. Students could be invited to review their experience more systematically, by assigning time specifically to this.

If a teacher (or a company) is eager to repeat an activity the following year, this is a good measure of its quality and usefulness. With “*Classe en entreprise*,” for example, while companies may have had some hesitations in the first year, almost all of them wanted to repeat the experience the following year.

While it is important to collect evaluations, the longer-term effect of these activities on students’ career choices should also be measured. For example, what effect do they have on students’ choices? How many students go on to choose science courses? The answers to these questions would complement the evaluations and make it possible to demonstrate the crucial role of joint school-industry initiatives.

The national platform mentioned above could also be responsible - in partnership with university research laboratories - for measuring the impact of these initiatives on the number of students choosing science courses.

