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Raising awareness among science students of their future careers and employability

Long sheltered from unemployment, science students today have to give some thought to preparing for their entry into working life. The French *Science Insert* project, selected from among the projects funded by the Fonds d'expérimentation pour la jeunesse/Fund for Experimental Youth Projects, is equipping them with the tools they require for this purpose. The method adopted to evaluate the project, the so-called double difference method, can be used to show that the awareness-raising measures developed in the course of the project are appropriate.

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Science students at university seemed for a long time to be sheltered from difficulties in finding employment. In some disciplines, such as engineering science, mechanical engineering, computer science and electronics, recruitment levels for new graduates were even comparable with those for graduates of the elite engineering schools. Students in the so-called basic sciences, for their part, tended to go into teaching or to register for PhDs in order to prepare for a career in research or academia.

However, since the mid-1990s, several factors have combined to cause students to lose interest in scientific careers. They include reductions in the numbers of those permitted to take the competitive examination for entry into teaching, the continued expansion of technological courses, competition from the engineering schools or even a perception that a PhD fails to confer a decisive advantage over the degrees awarded by the engineering schools (*diplô*mes d'ingé*nieur*). The 2005 Palaiseau symposium (cf. Further Reading, p. 4) clearly reflected this situation.

Consequently, some science-based universities have been induced to develop innovative measures with a view to making courses in these disciplines more attractive. These measures take various forms: raising students' awareness of their future careers and employability, creation of graduate directories, etc. The University of Rennes 1 has gone down the route of raising awareness among the 1,600 students on its science master's courses (cf. Box 1 on the following page) by putting in place a system intended to prepare them for a smoother entry into working life. This project, known as *Science Insert*, has three aspects to it. The first introduces an organisational innovation with the establishment of a new 'one-stop shop' providing careers advice and assistance with job hunting. The second sees the introduction of an innovative programme designed to build up links between students and the labour market by strengthening the role of professionals in delivering the teaching. The third and final innovation is instrumental in nature and aims to equip master's students with a 'toolbox' they can use when seeking employment. The *Science Insert* project is something of a trail-blazer in this area.

Selected as one of the projects financed by the Fonds d'expérimentation pour la jeunesse/

Box 1 • Students potentially benefiting from the experiment in 2010/2011

Science courses account for a high share of the education offer at the University of Rennes 1. More than two thirds of the students registered for master's degrees are studying scientific subjects; they total almost 1,600 individuals, distributed over 12 broad vocational or academic specialisms, which are themselves further divided into 51 sub-specialisms.

Department	Specialism	Numbers enrolled in 2010/2011
Structures and properties of matter	Physics	45
	Chemistry	128
	Mechanics and engineering sciences	69
	Earth sciences	84
	Archaeology	20
Mathematics	Mathematics	105
	Statistics and econometrics	65
Medicine	Public health	10
Environmental sciences	Ecology and environment	215
	Biology, agronomy, health	409
Computer science and electronics	Computer science	288
	Electronics and telecommunications	134
Total		**1 573**

Source: University of Rennes 1

Fund for Experimental Youth Projects (FEJ), this project has been accompanied by a synchronous evaluation exercise that aims to measure the effects of these three types of innovation on acculturation to working life among science students. One of the characteristics of this type of evaluation is that it takes place in real time, i.e. during the actual time that the measures are being implemented. Here it is the non-experimental method known as the double-difference method, combined with an econometric investigation using a model with qualitative variables (cf. Box 2), that is used to observe and measure whether the change in science students' acculturation to working life can be attributed to certain measures implemented in the course of the programme.

Application of this method shows that those students who benefited from the innovations introduced on the basis of protocols of the type used in the *Science Insert* project more clearly identify ex post the tools required for their professional development. This makes these protocols, designed to raise science students' awareness of working life, worthy of interest.

From science master's to a search for attractiveness

From the mid-1990s onwards, the number of students registering for science degrees began to decline, revealing a certain loss of interest among students in such courses. Part of the explanation for the decline lies in changes in the education offer which, combined with socio-demographic changes in the student population, made science degrees appear increasingly difficult. The last piece of the jigsaw is the shift among students, not just those studying science subjects, from more general, academic courses to more vocational degrees.

Even before the launch of *Science Insert*, the University of Rennes 1 had introduced measures that aimed to make the study of science more attractive. They included making master's degrees more vocational in nature, introducing a vocational element into certain masters originally intended solely for future researchers and increasing the number and length of compulsory placements. In 2010, therefore, the time was right for fostering these innovations, which sought to shift the emphasis of master's degrees towards greater vocationalism. For the 1,600 students on science master's courses, the first of these innovations was the opening up of their courses to partners from outside the university

An experiment based on innovative partnerships

The aim of the *Science Insert* project was to test the effects of putting in place various measures aimed at mobilising the various actors, raising students' awareness of the issues and hence, over the medium term, possibly improving their entry into working life.

Box 2 • Single difference, double difference and evaluation

With the single difference method the result 'after' an intervention is compared with that 'before' it. An alternative variant of this method involves comparing the ex post results (i.e. those after the intervention) for the test groups (i.e. the groups that undertook the programme of measures) with those for a control group (which did not undertake the programme).

With the double difference method, two changes in results are compared: the first in the test group and the second in the control group. By using random allocation, a control group can be formed that is genuinely similar to the one undergoing the measures, which immediately eliminates all selection bias. If the allocation is not random, it is still possible to control for sampling bias (age, sex, etc.)

The econometric investigation using qualitative variables involves testing a model with several variables that might potentially explain a dichotomous variable, in this case knowledge of the mechanisms of labour market entry. A probit-type model is used.

Box 3 • The double difference method in practice

In the course of the Science Insert programme, the evaluator identified two test groups (beneficiaries) and two control groups (non-beneficiaries). The measures in question are, firstly, the modules teaching job search and placement search techniques (JST/PST) and, secondly, the science masters forum. The numbers in the various groups are listed in the table below:

		Masters forum		
		Beneficiaries	Non-beneficiaries	Total
JST/PST modules	Beneficiaries	44	80	124
	Non-beneficiaries	47	98	145
	Total	91	178	269

92 % of the student respondents enrolled on master's courses had obtained a science baccalaureate. Slightly more than 15% of them hold a DUT (2-year vocational degree), mainly in mechanics, computer science and electronics.

As far as their career plans are concerned, half of the student respondents wish to seek employment at the end of their course, while almost a third want to go on to do further research (basic or applied).

The double difference method is put into practice in the following way. The sample is divided into two groups:

- a control group that will not undertake the programme but make it possible to observe the trajectory of a non-beneficiary;
- a test group that will undertake the programme.

An initial survey, known as a baseline survey, is carried out right at the beginning in order to gather data for each group before the experiment gets under way. The aim is to measure each group's initial knowledge about the mechanisms of labour market entry. Thus all the students enrolled on science master's course were questioned at the beginning of the academic year. A second survey is carried out at the end of the first year of the experiment in order to collect data that can be used to track the evolution of science students' awareness of the mechanisms of labour market entry (the indicators used to measure their increased awareness are outlined in Box 4). Thus the same students were questioned again before they left for their placements.

The change between the initial and final surveys in each of the variables approximating acculturation is measured for each of the groups. Thus the difference between two periods measured for the control group represents the 'normal' change (i.e. without benefit of the programme) in acculturation to vocational integration. The difference between two periods measured for the test group also takes into account the programme's impact on the evolution of students' knowledge about vocational integration (sum of the normal change and the effect of the programme). Thus by calculating the difference between these two measurements, the programme effect can be isolated.

In order to give the services provided for students a more vocational dimension, the university sought to bring together expertise from both within and outside the institution. To this end, it de cided to strengthen its institutional partnerships with occupational groups, firms and the actors involved in labour market entry. It was necessary to mobilise all departments within the university that had forged close links with business and industry, as well as heads of discipline and, last but by no means least, students themselves.

This 'skill cluster' proposed several concrete measures for implementation. T hey included:

- launch of a digital vocational integration and corporate relations platform (TRIPTIK) aimed at three audiences – students, graduates and companies – and providing dedicated functions: applications with reserved access (filing of and advice on placement and job offers, filing of and advice on students' CVs authenticated by the university, graduate directory), degree guides, work and advice sheets to help students and graduates develop their career plans, detailed webographies and surveys of the occupations in which graduates of the university find employment;

- the inclusion in many courses of modules teaching job and/or placement search techniques (JST/PST modules) designed to support students as they develop their career plans and job/placement search strategies with the tools necessary for compiling CVs and letters of application;

- establishment of a science master's forum, a privileged space for meetings between students, lecturers and firms targeted on the basis of their sector of activity. Offers of placements and jobs are made directly to students, enabling them to put the practical skills acquired in the course of the JST/PST modules to use.

The originality of such a project lies in the use of skills from outside the university, in particular for the coaches and consultants recruited to lead the JST/PST modules. In addition, the introduction of a more individualised service made it possible to tailor the external skills as closely as possible to the students' needs.

An evaluation using the double difference method

At the outset, the protocol selected was a quasi-experimental evaluation using the ex-ante and ex-post group comparison method. Two groups of specialisms (among 12) were formed by drawing lots; each group undertook a specific programme. As it turned out, the quasi-experimental conditions under which the *Science Insert* programme took place proved difficult to create. On the one hand, the JST/PST modules were introduced on a case-by-case basis depending on the measures already in place and whether or not the lecturing staff in

Box 4• The choice of evaluation indicators

On the basis of the project as defined by the experimenter and taking account of its working hypotheses, the evaluator identified various indicators that would best enable students' acculturation to vocational integration to be tested:

- labour market knowledge: unemployment rate, level of the national minimum wage, average monthly net pay;
- knowledge and appropriation of the tools designed to aid vocational integration: the graduate directory and national and local recruitment surveys (level of knowledge, frequency of consultation, reasons cited), salaries and employment rate for graduates in their discipline, the role of the Careers Guidance and Company Information Service (level of knowledge, frequency of visits, reasons cited);
- identification of the people best able to offer advice or information on various topics linked to their entry into working life: drawing up a career plan, placement search, tools to assist with job search (CV and letters of application), companies' contact details, identification and development of their skills and competences, establishment of a professional network, evolution of occupations, etc.

charge were interested in them. On the other hand, the other measures that were introduced (forum, directory, digital platform) became accessible for all students, which made it impossible to separate the beneficiaries from the non-beneficiaries.

The evaluation method that was finally selected, known as the double difference method, took account of the realities of the context and organisation of the master's courses.

The double difference method has a number of advantages. Since it is based on an econometric investigation using a model with qualitative variables, and particularly the probit test, it makes it possible to attribute (or not attribute) the evolution of the indicators linked to knowledge of how to find employment to the measures put in place between t0 and t1 for each of the four groups identified. Secondly, it makes it possible to assess whether the evolution of those same indicators is significant depending on whether or not the students benefited from each of the measures put in place.

Initial lessons

Two main lessons have been drawn to date. First, all the students were relatively ignorant at the outset of what was required for a successful job search and identified real needs in terms of support and assistance. The analysis revealed that at the end of the first year of the experiment they were better able to identify the tools and actors relevant to their entry into working life; this improvement was attributable to the measures put in place for their benefit.

Second, the programme revealed a need for 'specialists' in vocational integration. At the end of the various measures, the students tended to regard the advisers from the careers guidance service (CGS) as the people most likely to advise or inform them about the many problems associated with their entry into working life. The specialists were identified in preference to lecturing staff, who are still, nevertheless, their main points of contact in this regard.

In general terms, the students emphasise the value of the various measures put in place by the CGS, which they perceive as responses adapted to their needs. However, many express the view that they came too late.

Thus it should also be expected that the science students' acculturation to the issues around their future careers and employability will also be subject to a 'scheduling effect'. The *Science Insert* project is set to be implemented over two years: at the end of their first year, students choose a speciality on which they stake their admission to the second year of their course. It is not until the end of the second year that they aim to find a placement and then enter the labour market. Their immediate concerns – focused primarily on their chances of obtaining their degree but also in some cases on the funding of their studies – cause students to postpone the moment at which they start to take serious action with regard to their future careers. Thus innovations of the *Science Insert* type, introduced in the course of master's degrees, are the first milestones in a gradual process.

Further reading

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