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FRENCH NATIONAL REPORT ON ICT, GENDER AND EDUCATION

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French National Report on ICT, Gender and Education

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Summary

In French higher education, scientific students' most selective itineraries tend to be preferentially followed by males. Girls tend to follow medical sciences, humanities, management and social sciences. Those differentiations have started in upper secondary school. Even if boys have better results in mathematics in elementary school, in lower secondary school differences in mathematics between boys and girls are not statistically significant.

Before higher education there is no specific ICT courses, except in technical subjects. In lower secondary school ICT teaching is part of a subject named technologie, which mostly aims at giving pupils a technical culture. An ICT certification (B2i) is organized at primary school and at the end of lower secondary school. In upper secondary education, a new project of mathematics curriculum offering space for algorithmics is being debated, but it is mostly focused on mathematics.

1. Overview of Gender repartition during mainstream school education

In 2007/08, the school population in France for both public and private sectors was around 12 million pupils, representing 79 % of the population between the ages of 0 and 20, and 23.2 % of the total French population. About 6 million and a half of these students attended primary school, a little bit more than 5 millions in secondary education. More than 2 millions attended university (EURYDICE, 2009). There were 870 000 primary and secondary teachers.

According to (Observatoire des inégalités, 2009), an independent institution devoted to analysing inequality, French girls perform better in primary school than French boys (see Annex 1), and are more present at the university. However, boys are more likely to get a PhD. Boys perform better in maths in elementary school, but this advantage fades away in fourth grade of *collège*.

In high school, boys are much more represented in the scientific series, which leads to the most selective branches of higher education like *Grandes écoles* (see Annex 3).

At university, girls account for three-quarters of students in literature and history classes but only 30% of scientists. They represent only a quarter of the students majoring in engineering schools.

The scarcity of women in scientific careers may be related to the process of successive orientations that pupils are submitted to during their studies.

Organization of the French educational system in brief

In France, education is compulsory between the ages of 6 and 16. It is divided into four stages:

- *École élémentaire* (primary education, ages 6-11)
- *Collège* (lower secondary education, ages 11-15)
- *Lycée d'enseignement général et technologique* (upper secondary education) or *Lycée professionnel* (upper secondary vocational education, ages 15-18)
- Université et Grandes écoles (higher education)

Until the end of lower secondary education, school is currently undifferentiated and families make no orientation decisions. At the fourth year of *Collège* students must choose a specialty that will have to be confirmed at the end of the first year of *Lycée* by choosing a specific itinerary for preparing the national exam called *Baccalauréat*. There are three different type of *Baccalauréat*:

- General (economic and social, humanities, scientific)
- Technological (sciences and technology, industrial sciences and technology, laboratory sciences and technology, health and social sciences, administration).
- Professionnal.

A recent report (Defresne, 2009) shows that girls, on the average, perform better than boys but choose less itineraries toward the most prestigious careers. The same report signals that "85% of women and 80% of men aged 20-24 had a diploma of upper secondary education in 2007 (p. 13). Selections occur via the choice of elective subjects: girls represent 93% of students in medico-social secretary careers and boys 94% of students in industrial informatics (p. 19).

Things might be changing in the future since parity is inscribed in the organic law of finance, one of the objectives of which is to attain a rate of 45% for girls in scientific terminal classes, which was 39% in 2007 (p. 23).

Students who get the *baccalauréat* have a right to pursue higher education. A singularity of the French system (which is now organized according to the Bologna reform) is the fact that the two first years of the first cycle of higher education may be followed either in universities or in high schools having special classes. Those classes prepare either for:

- A technical diploma (Brevet de technicien supérieur), or
- Competitive exams opening access to "*grandes écoles*": *les classes préparatoires*.

A 2008 study has shown that boys represent twice as many than girls to inscribe themselves in these classes (Lemaire, 2008).

Among students in *classes préparatoires*, some of them follow scientific itineraries. Interestingly enough, girls represented 30% of the total amount of those scientific students (but nearly 75% in the literature and humanities preparatory classes). The most prestigious *grandes écoles* are the *Ecoles Normales Supérieures*, which were explicitly created to prepare second-degree *teachers*, but which is now considered as schools for preparing to teach in higher education and higher administrative positions.

Gender differences at High school level

As showed in Annex 2, in the early part of 2007, for mainstream upper secondary schools, female students largely outnumber boys in the humanities (80%) and economics series 63%). In scientific series, on the other hand, female students represent almost one half of the total number, except for the mathematics and engineering specialty, where they are respectively 40% and 13% (INSEE, 2007a). The selection happens at the end of the first year, which is undetermined and where all students follow the same courses (except for a few elective subjects).

Gender differences in higher education

Trends pointed in upper secondary schools are confirmed at university level. Annex 3 shows the proportion of females for each grade in the French universities. In 2007,

students who were following courses of economics, business and management studies, social administration studies and life sciences were approximately 50%. Women were more numerous at the *licence* level (bachelor) of language studies, humanities and social sciences. Fundamental sciences were mainly followed by males especially at the master level (INSEE, 2007b).

By performing a correspondence analysis on this data, we can recognize the hierarchic positions of the different subjects.

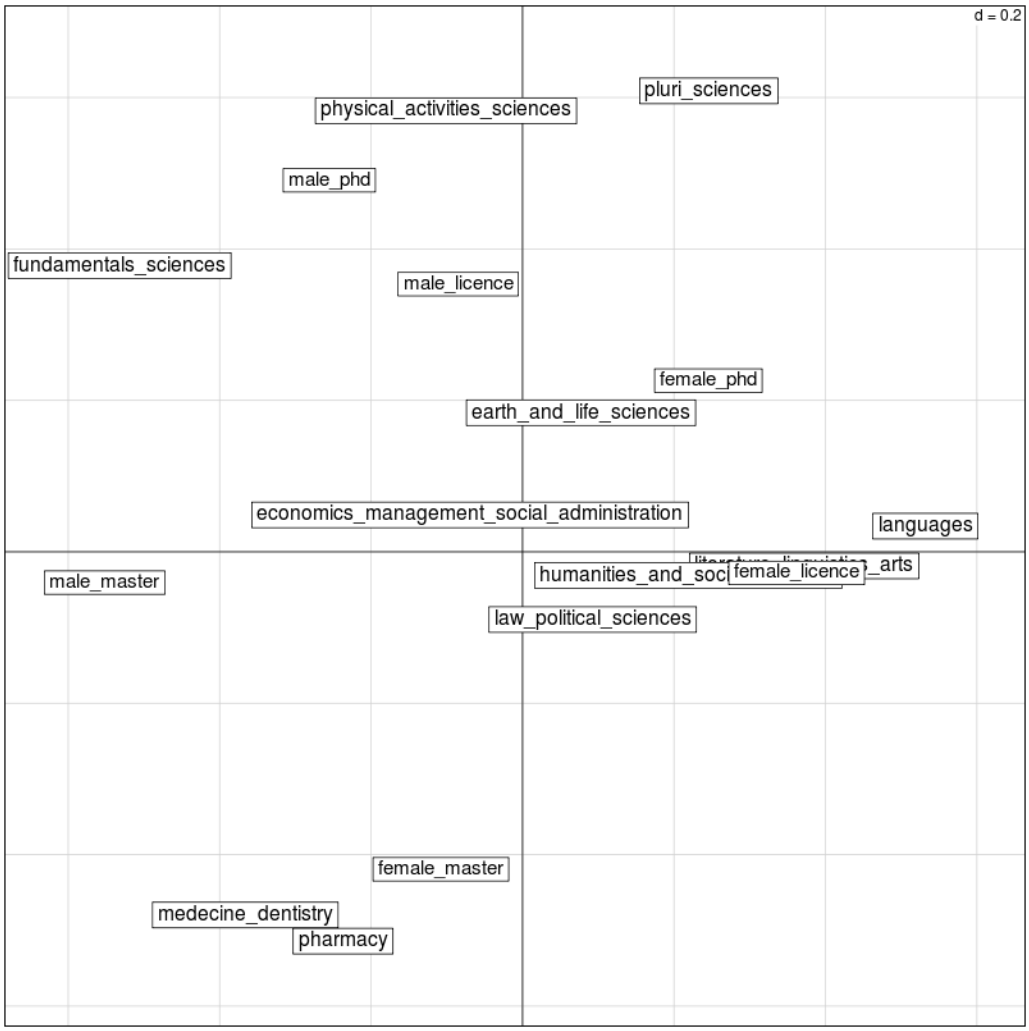

Illustration 1: correspondence analysis of the student repartition. Source: official statistics. Mast: master ; lic: licence (bachelor). Funda : fundamental. Horizontal axis: 49,06% of ; vertical axis : 35,83% of inertia. See INSEE 2007b.

The horizontal axis of this graphic (see annex 4 for details) opposes scientific studies and male master students (on the left) to rather literary and humanities studies and

female students (on the right). The second axis opposes medical studies and master female students to more fundamental sciences and male students.

If this figure confirms that gender differences clearly appear, the roots of this gender inequality is to be searched in ancient academic traditions and find their origin in differentiations happening well before.

The under representation of women in French ICT engineering schools

Even if, in 2008, the number of women had increased by over 50% during the last 15 years, female students are less present in French engineering schools than at university. According to the National observatory of student life (Eloy, 2008), an official institution producing statistics about student careers, 58 percent of university students were women in 2008, while this percentage fell to only 27 percent in engineering schools, except in agronomy and life-sciences, where almost two third of the population were female students. The proportion of girls is at its lowest rate in ICT engineering schools (13 % for telecommunication and informatics engineering schools).

2. ICT, young people and gender in the French society

In France, as in other European countries, youngsters have frequent uses of diverse ICT devices, from cellular phones and smart phones to word processing and computer games. Differences can however be remarked, according to the social milieu, and also to gender (OECD, 2008). But to which extent?

In 2003, Josiane Jouet produced a remarkable synthesis on research about gender and ICT (Jouët, 2003). She concluded that "Neither gender nor technology determinate technology usage and huge disparities exist between women, according to their social status, their level of education and their age" (p. 68). For her, communication technologies "tend to blur the traditional social landmarks of face to face and oral communication and the tags of social status, race and sex" (p. 76).

She remarked that technologies may bring an inversion of existing stereotypes, women tending to be more rational in their technology uses than men, she insists on the fact that the social construction of gender is evolving and concludes on the urgency of leading new research, on account of the fact that existing studies are often "piecemeal and locked in binary categories that hinder to take into account the flexibility of technology and the fluidity of gender" (p. 83).

Since then, new software has been released and disseminated, in particular what relates to the so-called WEB 2.0: blogs, forums, Facebook… Children and youngsters are heavy users of these tools and gender differences are quite certain. But few researches have so far investigated this issue.

A key point proven by research is that youngsters, when confronted to ICT have difficulties as soon as they are confronted to problems that require conceptualization of processes (Baron & Bruillard, 2008). So what happens in the school which plays a paramount role.

3. ICT in the French educational system in a nutshell

General context

In France, for each wave of "new technology", public policies aiming at introducing and developing educational uses of this technology have been launched since the 1950. The movement has been similar to what (Cuban, 1986) has described: for each wave of technology: an initial enthusiasm (with the emergence, as (Dieuzeide, 1982) phrased it of "prophets and merchants", followed by a disenchantment when it became clear that this particular technology was not going to revolutionize the education system.

Concerning computers (or rather *informatique*, i.e. information technology), a first national scheme concerning upper secondary schools was launched as soon as 1970. Other national plans have followed and local and regional authorities have also taken many local initiatives. The national ministry of education has however the responsibility of setting objectives, defining contents and standards. Three key facts may be quoted here.

- The priority given to the *integration* of ICT in the various school subjects.
- The existence of a quality label for educational software and resources: (*recognized of pedagogical interest - Reconnu d'Intérêt Pédagogique*, a patented name).
- The creation of a certificate for Informatics and the Internet (B2I – Brevet Informatique et Internet), with initially two main degrees: at the end of primary education and lower secondary education. A similar certificate has been created for students (C2I) and will be compulsory for teachers for becoming tenured. It

defines a set of basic competencies that students should possess, not only in technical fields: but also it covers awareness of societal issues linked with the dissemination of information technology.

The key point is perhaps that, if in the compulsory school system there is a certification of ICT competences, there is not, except in technical and vocational subjects, a specific ICT curriculum (Baron, 2007).

A crucial consideration is therefore linked to teacher education at large. There is, in France, a long history of ICT in teacher education. But information technology seldom intervenes in the competitive examinations that select teachers (except in technical and scientific subjects and for school librarians) and in the corresponding curricula. Therefore, it is currently not an important component of IUFM training.

ICT-related teaching

In what follows, we have mainly focused on secondary education.

a) Lower secondary school

Technologie has been taught under this name in French lower secondary education since 1985, when it replaced another subject: *Travaux manuels éducatifs* (educative manual works). One of the key elements of the new curriculum has been to introduce items linked to information technology. Several curricular changes have occurred since, but *Technologie* is still a discipline where every young French may learn the elements of informatics. Research shows that, in effect, that it does play this role (Fluckiger, 2007).

Another subject contributes to educating youngsters: it is called *documentation*. In France, school libraries at the secondary level are named *Centres de documentation et d'information* and are under the responsibility of specific teachers, having the same status as other teachers, except the fact that they have no specific curricula and belong to a discipline of service to other subjects. Documentation claims the responsibility of helping students become information literate.

At the end of college, students have to pass the B2i certification, which is now compulsory. The organization of this certification depends upon head teachers and is fundamentally based on the acceptance by teachers of what pupils declare about their competences.

In 2005, a quantitative governmental study claimed that half of the teachers think that the implementation of B2i supports the use of ICT in the classroom. They also think that B2i encourages teachers to train themselves to the use of ICT (Gentil & Lévy, 2005).

b) Upper secondary school

If Informatics has been taught at upper secondary school level as an elective subject in the 1980s, this has not been the case for nearly two decades. Recently, under the impulsion of an association, ASTI (Association des sciences et technologies de l'information), a reflection group (ITIC) has proposed the creation of a new informatics curriculum[1]. However, the government has preferred so far the integration of ICT contents (in particular algorithmic) within the mathematics curriculum.

c) Higher education the C2i certification

Last but not least, a specific scheme has been launched in higher education : *Certificat informatique et internet*. Official texts provide a referential of competences and specify that a specific teaching must be organized in the first years of university, in order to get the first level of this certificate (C2i - 1). A second level, professionally oriented, has been organized in various fields: medicine, law, and education… Official texts stipulate that students must be ICT certified before they can act as recognized professionals.

This scheme is still very new and research is still needed in order to appreciate its impact. However, the first results suggest that situations hugely vary according to universities ; (Baron, Bruillard, & Pochon, 2009).

As a contribution to the study of gender differences in the acquisition of C2i-1, we'll report here a simple study performed on a sample of students at Paris Descartes University in 2008-2009.

Three faculties have been considered : mathematics-informatics, psychology and sport activities. The study has looked at the differential success of C2i-1 certification of males and females. Results have an indicative character only and more investigations would be needed to obtain more precise information.

- In psychology, where 81 students out of 197 have been certified (41%), girls are a majority. Their certification rate is 37%, while among the 28 boys, 20

[1] http://www.epi.asso.fr/revue/editic/asti-itic-lycee-prog.htm

succeeded. We perhaps have in this context the manifestation of a classical gender stereotype where males make a point of being technical.

- In mathematics and informatics, where boys are a majority, the rate of certification is also 42%. But 67 males out of 147 were certified (45%) and 23 females out of 52 (44%). There is no gender bias here. Or rather gender bias has happened somewhere before on the line.
- Among the sport students, where the rates of boys and girls are roughly equal (but the sample is small, 101), no significant difference can be found. The rates of success are rather low, around one third.

ICT in existing school subjects

The presence of ICT usage in the existing subjects may be considered as variable and depends upon a large series of factors. If educational technology remains something teachers generally do not use much, ICT instruments have disseminated in a series of disciplines. In fact, two kinds of instruments may be considered:

- General-purpose tools (like word processors and spreadsheets).
- Specific subject-oriented software (computer algebra systems, experimentation software in physics or biology, drawing and modeling software in mechanics…).

Uses of such software heavily depend upon the curricula and the situations. We'll only give here examples, in order to illustrate the fact that the relation to technology depends very much upon the contexts.

- In technical and vocational subjects, students tend to adapt well to the kind of software that is going to be part of their professional life.
- Regarding a tool like the spreadsheet, no significant differences in uses have be found between boys and girls (Aoudé & Baron, 2009).

ICT-related textbooks and resources

Our main results of the analysis of a sample of textbooks in *Technologie* from 1986 to 2006 show that men are more often represented in pictures than women, with a differentiated social status : women tend to be consumers and men tend to have leading responsibilities.

Nevertheless, in recent textbooks, we've found a growing awareness towards gender issues a tendency to suppress stereotypes, and to present symmetrical situations. Contents linked with ICT are generally neutral. But, the proportion of men teaching this subject is regularly increasing. We also analyzed a sample of 230 online resources mainly coming from institutional portals in *Technologie*. Those resources have been produced by groups of teachers under the supervision of inspectors. This process is rather close to what happens for textbooks. The resources tackle a wide spectrum of subjects often very technical, with no evident sexist approach. We noticed that authors tend to be men, but like a majority of technology teachers are men (70% in 2008). We have no empirical data on their uses. They probably have a limited dissemination. But they may serve as possible models, especially when curriculum is just reformed and textbooks not yet published.

Interviews with teachers

In the context of the PREDIL project, we have performed a preliminary inquiry addressing 200 teachers (130 women and 72 men) of 9 lower secondary school in a rural area in the north of France, where each teacher has a computer provided by the local authority council. Findings show no significant differences between female teachers and male teachers in their uses of ICT as a tool for teaching. Nevertheless teachers' representations of male and female students about their general behavior at school are gender centered. For example, among the qualities attributed to girls conscientious is quoted by a majority of women and applied by a majority of men. Boys, on the other hand, are rather qualified of quick...

4. Discussion

Finally, in France, ICT has not yet emerged as a stable component of student education. It has two main orientations, each of them playing a specific role from a gender perspective.

ICT, as a set of competences or curricular orientations, has a weak presence. The technological culture transmitted by *technologie* and *documentation* has certainly real effects but cannot be considered as playing an important part in students' choice of itineraries and academic careers.

ICT as a part of other subjects deserves a careful examination. No conclusive research results have so far been produced. But the first studies suggest that the situation is actually diverse and complicated. Two main axes may be considered.

The first one is didactical. It may be suggested that the use of software instruments offering alternative ways of representing the reality and allowing for more experimental attitudes might help combat stereotypes traditionally associated with mathematical abstraction. This is the case in the different sciences.

The second is linked to the use of software instruments. Much depends here on the degree of presence and credibility of theses tools from a professional point of view. For example, spreadsheets are extremely used in administration and management. Technical subjects preparing for such professions will incorporate without much difficulty ICT tools that are known to be compulsory in the everyday professional work.

One important consideration, which leads to an important limitation of the studies we'll be launching, is linked to the difficulty in separating variables…

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Annex 1 results from *Observatoire des inégalités*, 2009, secondary school

Proportion of pupils at the end of school and college who have mastered basic skills

Students at the end of primary school

	Girls	Boys
French	89.00%	83.70%
Mathematics	88.10%	91.10%

Students at fourth grade of *Collège*

	Girls	Boys
French	85.50%	74.50%
Mathematics	89.40%	89.40%

89% of boys and girls master the basic mathematics at the end of *collège* in 2007.

Source: Ministry of Education, Students and CM2 third school in France and the DOM in March 2007.

Annex 2: Upper secondary education

Specialty followed by students during the last year of *Lycée Général*

Source: INSEE 2007

Literature Series (L)

Specialty	Girls %	Boys %	proportion of Girls %
Languages	63.8	63	80.2
Ancient Languages	2	2.5	76.3
Arts	22.3	24.5	78.5
Mathematics	11.8	10	82.4
Total Terminale L	100	100	80

Economic and Social Series (ES)

Specialty	Girls %	Boys %	proportion of Girls%
Languages	33.6	26.5	68.3
Social Sc., Economy	35.1	41	59.2
Mathematics	31.3	32.4	62.1
Total Terminale ES	100	100	62.9

Scientific Series (S)

Specialty	Girls %	Boys %	proportion of Girls %
SVT	44.1	27.1	57.8
Physics	34.9	33.8	46.6
Mathematics	18.2	23.3	39.8
Engineering	2.7	15.8	12.7
Total Terminale S	100	100	45.8

Public and private contracts upper secondary school, Ministry of Education.

Source: Ministry of Education, Depp.

Annex 3: Grandes écoles

Proportion of girls in preparatory classes and *Grandes Écoles*

Source : statistics from Observatoire des inégalités 2009

	Total	proportion of girls in%
Preparatory classes (CPGE)	78 072	43.00%
Science	48 361	30.00%
- Economics	18 323	55.00%
- Literature	11 388	75.00%
Schools of Engineering	104 218	27.00%
Business School	87 666	48.00%
École Normale Supérieure (ENS)	3 680	39.00%
ENA (promotion 2008)	81	40.00%
Polytechnique (2008)	399	14.00%

School Year 2007-2008, Source: Ministry of Education, ENA, Ecole Polytechnique

Annex 4 University students

Proportion in percentage of female students at University by discipline. Year 2007-2008

Source: INSEE, 2007

	License	Master	Doctorate	Total
Law, Political Science	65	66.1	48.1	64.6
Economics, management	50.8	52.2 4	43.7	51.2
Economic and Social Administration 6	60	59.2		59.8
Literature, linguistics, arts	73.2	75.1	65.4	73.1
Languages	74.7	77.3	67	74.9
Humanities and Social Sciences	69.7	67.8	52.8	67.9
Multi-lingual letter-Humanities	71	74.4	46.4	72.8
Basic Sciences and Applications	29.1	26.1	27.7	27.8
Life Science	61.8	56.7	51.9	58.9
Science and technology of physical activities and sports	32.3	32	36.4	32.3
Pluri Science	43.4	43.4	25.5	43.3
Medicine - Dentistry	65.7	58.3	45.5	60.8
Pharmacy	65.9	68.1	57.6	67.1

Figure 1 first axis of correspondance analisis performed on the above data

rows first axe 49 % of variance	coordonates	contributions	cos2
fundamentals_sciences	0.53206379	35.7880630	0.64186672
medecine_dentistry	0.36612867	16.9791099	0.36379273
pharmacy	0.23708320	1.4271224	0.16399153
physical_activities_sciences	0.10111482	0.2618796	0.01842097
economics_management_social_administration	0.06925191	0.6666999	0.16006360
earth_and_life_sciences	-0.07723666	0.3314403	0.02718083
law_political_sciences	-0.09265130	1.2249638	0.45404694
humanities_and_social_sciences	-0.21891923	8.1558579	0.84339432
pluri_sciences	-0.24599125	1.0750474	0.09062023
literature_linguistics_arts	-0.37193887	10.6898077	0.91954735
languages	-0.53187346	23.4000082	0.90349354