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## Gender and ICT in education : which Role for Textbook and Portals ? Results from the PREDIL European Project

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### Abstract

*ICT is not, like mathematics, a well-established school subject. How do pupils learn to use ICT instruments at home and at the school? How do they become familiar with them? Which role does play the school in this process? How does it cope with gender issues? In France, if a certification is proposed at different key stages of the curriculum (B2I, Brevet Informatique et Internet), ICT mainly appears, in lower secondary education. The subject Technologie is the main place where ICT is taught along with other technologies, in particular those used in the industrial field. In order to learn ICT-related facts, students may use textbooks, web sites and internet tools as pedagogical resources. We chose to analyze those resources, which are used by teachers and pupils, looking for possible gender stereotypes within the iconography and the exercises. The pedagogical resources we analyzed generally pay attention toward presenting gender-neutral resources.*

## 1 Context: considerations about gender issues in France in a nutshell

### 1.1 Gender-biased school itineraries

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 below 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 analyzing inequality, French girls perform better in primary school than French boys 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 lower secondary school: *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*.

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).

### 1.2 ICT and gender

In France, as in other European countries, youngsters make abundant usage 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 early 2000, 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 plays a paramount role. We'll only present here what is relative to compulsory education, because this is where many things begin to be shaped.

## **2 ICT in the school: the case of compulsory education**

### **2.1 A discrete presence of ICT**

In France, the history of the introduction and dissemination of computers (and later ICT) in schools is rather long (it begins in 1970). National governments have long played a very important role for launching ambitious policies, equipping schools and proposing in-service training schemes for teachers (Baron & Bruillard, 1996). With time, however, and with the rise of the decentralisation, process launched in the 1980s, the interest of the national state has receded and, to different extents, local and territorial political powers have taken over, except in pedagogical matters and in the recruitment of teachers that still remain a responsibility of the national state.

To make a long story short, according to official texts, ICT has a significant place in it. A list of ICT competencies has been defined and a specific certification (*Brevet informatique et internet*, B2i) has been created by the government in 2000, with 2 levels (primary school and end of lower secondary education). Passing it is compulsory. But there is no specific ICT curriculum. The idea put forward by the government is that ICT should be integrated in the different disciplines, so that the necessary competences are supposed to be acquired there.

### **2.2 ICT in the existing school subjects**

In secondary education, a problem that has often been underscored is that these disciplines seldom integrate ICT in their curricula, except in the technical fields. 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. 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.

### **2.3 “Technologie”, an exception**

*Technologie* is a compulsory discipline taught in lower secondary education (1.5 hour each week through the 4 years of *collège*). An heir to a previous field named “*éducation manuelle et technique*”, it has been created with its present features in 1985, with the aim of transmitting to everybody a technical culture. The curricula has been reconfigured to include information technology in 1995. From a pedagogical point of view, original features have been defined, like the obligation of realizing projects (Martinand, 2003). Practically, it is the main place where every young French will encounter courses linked with information technology. Researchers like Fluckiger have shown that it plays a great part in the appropriation by children of terminology and concepts linked to ICT (Fluckiger, 2007).

A rather important point is that while a majority of teachers were women in 1985 (around 60%), this proportion has now dwindled to 30% only.

### **2.4 An important place for on-line resources**

In France, since the early 90's, many initiatives have aimed at developing a provision of digital resources for online education. In the late 1990s, due to National policies, large institutional portals have appeared.

The most developed, EDUCNET<sup>1</sup>, (opened August 1998) is operated by the ministry of education. It proposes validated resources classified by disciplines, levels, etc. The main objective is the dissemination of legitimate teaching practices based on the use of ICT.

Another important portal, Educasources<sup>2</sup> is a database of digital online resources freely accessible to public access free and operated by the educational institutional publisher : SCEREN. This public institution is organized as a network of centers present everywhere on the French territory that operate in the framework of the National center for Pedagogical Documentation (CNDP), an institution under the regulatory authority of the ministry of education. It aims at “providing teachers and librarians a set of reliable online quality resources, aligned with the curriculum and selected by experts and librarians . The available resources have been filtered by pedagogical authorities and have thus received a label, an academic legitimacy. But many other websites do exist, with variable notoriety.

Thus, only some of the resources easily available to teachers and students have been validated by an institution, either public or private (publishers). It is not easy to determine, for readers, what is the validity of the information they retrieve. It is easier when the website has been produced by a reputable institution (but some institutions have sites with a modest coherence, due to problems of upgrading). When the authors do not have a reputation, the situation is more critical (Baron & Dané, 2007).

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1 <http://www.educnet.education.fr>.

2 <http://www.educasource.education.fr/>

### 3 The PREDIL project

#### 3.1 *Aims: how to achieve equity between gender in ICT related teaching?*

Gender issues linked with ICT and more generally scientific and technological fields seem to be similar everywhere worldwide (Cohoon & Aspray, 2006). We have been participating in a series of European projects aiming at analyzing this issue. The current project (PREDIL) aims at better understanding the processes underlying the imbalance in the take up of ICT by boys and girls at school and university<sup>3</sup>.

We have relied on the working hypothesis that, for young children, gender stereotypes linked to ICT are rather weak. Except for games, digital tools are used quasi equally by boys and girls. But, at adolescence, stereotypes do indeed appear and the issue of a possible gender divide may be raised. The crucial role of the school at this age, is to equitably offer ways for rightly conceptualizing phenomena and processes. We have also relied on previous work showing the great importance of teacher action for raising their students' awareness of gender issues and for offering “good” models (Mosconi & Stevanovic, 2007).

From a methodological point of view, we have chosen to focus in a first phase on secondary education, using mixed methods: we concur with the ideas expressed in the WOMENG project (Pourrat, 2006, p. 12 - 16). In such a European project, with partners coming from countries having very different traditions, the main challenges are to ensure comparability, to try to go beyond both variable oriented and case oriented approaches and to cope with issues linked to the importance of the database of results being both quantitative and qualitative (and in such a case being written in different languages). We also decided to carefully distinguish between different uses of ICT: using general instruments, blog creation, websites traffic, twitter, Facebook, but also educational technology and specific ICT teaching...

Several studies have been launched: focus-groups with teachers, textbook and resource analysis. We'll present here what we have found with textbooks and resource analysis in junior secondary education, because we thought it was a convenient way of identifying possible stereotypes.

#### 3.2 *Methodological choices for analyzing ICT-related resources*

One of the reason why we chose to analyze textbooks in *technologie* is that this discipline is the main place where students are confronted with ICT at junior secondary level. As any other French discipline, it relies on textbooks chosen at the school level between a series of proposals by private editors. There is no government-driven agreement procedure and the market is free and open. Quite normally, textbooks receive the support of some personality (inspector, instructor in teacher education, academic...) who co-signs the book, thus guaranteeing its contents.

We have chosen to analyze a series of 20 textbooks (from 1986 to 2006) published by several publishers and addressing different grades. Our choice has been driven by the known dissemination of these textbooks and, also, by convenience factors. In particular, we have extensively worked with the library of *Ecole normale supérieure de Cachan*, a *grande école* specialized in training teachers and academics of technical education.

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3 French portal: <http://prema.paris5.sorbonne.fr>. International portal: <http://predil.iacm.forth.gr>

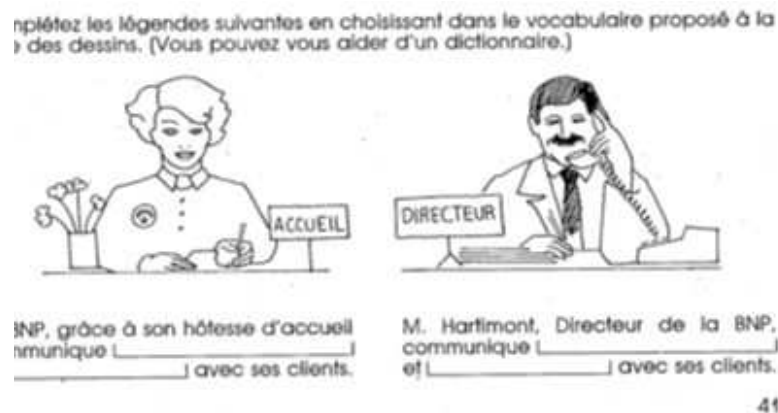
The method we used is the one described by Brugeilles & Cromer (2005). We focussed on the iconography and on the study of exercises. A particular attention has been paid to the social position of each protagonist in the situation shown in textbooks and to the lexical feminization of professions. Chatard, Guimond & Martinot (2005) show that this choice increases the confidence in students to project themselves into the profession (both for girls and boys).

Regarding on-line resources, we have focussed on a series of 230 institutional resources present on a national portal run by the ministry of education<sup>4</sup>. We have chosen to study the authorship and the contents of these resources.

## 4 Results:

### 4.1 Textbooks

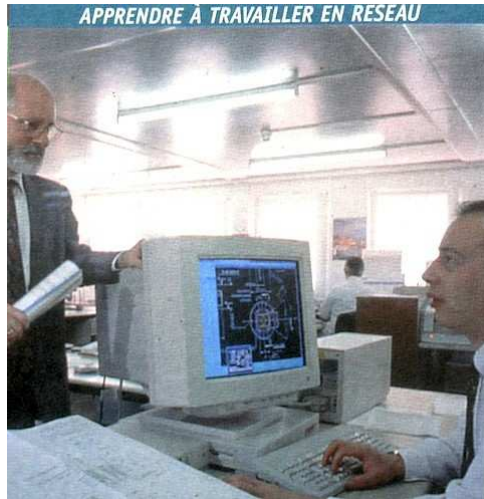
Our analysis of a sample of textbooks in *Technologie* from 1985 to 2009 shows that men are more often represented in pictures than women. In this sample, we found 257 pictures representing men in a professional context, 82 pictures representing women in a professional context and 45 representing both men and women in professional context. Moreover, when women are shown they are significantly more represented with a differentiated social status : women tend to be consumers or employees whereas men tend to have leading responsibilities. This can be seen in the first *technologie* textbooks and even in some more recent ones.



*Illustration 1: Bonnet G., al.. (1985) p. 41. the man is an executive and the woman is employed at the reception desk*

In the 1990, topics pertaining to the traditional technological fields were traditionally linked to the working universe of men : engines, machines. Regarding ICT-related jobs, illustrations also more often show males in a situation of manager than females. The same is true for ICT technical skills. In the 1990s, men tend to be shown in contexts that require technical knowledge (coding, network design...): see illustration 2.

<sup>4</sup> <http://www.educnet.education.fr/bd/urtic/technocol/index.php>



*Illustration 2: Cliquet, J. & al. (1998, p. 164)*

For their part, women are rather represented in contexts linked to communication and to the *new literacies* defined by Leu, Kinzer, Coiro, & Cammack, (2004).



*Illustration 3: Cliquet & al, 1998, p. 88.*

In the textbooks published in the years 2000, we found a growing awareness towards gender issues a tendency to suppress stereotypes, to valorize girls and to present symmetrical situations. Moreover some textbooks focus on men overrepresented occupation and promote gender equity by exposing positive aspect of those jobs.

## 4.2 The case of on-line resources

### 4.2.1 Institutional portals

Let us first recall that the on-line resources we studied were produced by groups of teachers under the supervision of inspectors. This process is rather close to what happens for textbooks, except that the final validation has been explicitly granted by an institution and not by a private publisher. Several results were found. First, authors tend to be men, more often than women. A wide spectrum of themes are present, often very technical, like achievements controlled by computer. No explicitly gender-biased content could be found.

A limitation of this finding is that no empirical data are available on the usage of these resources. It may be that they are not much used. However we can suppose that consultations increase during critical events in the life of a subject matter (reforms). Yet, they may serve as possible models for teachers.

### 4.2.2 Other portals

Several other kinds of portals do exist on the web, developed by schools, by associations, publishers and even by individual teachers. A huge diversity was observed between them, including regarding gender. For example, Illustration 3 has been found on the B2i portal of a public *collège*.



Illustration 4: Portal of a public collège

This image is stereotypically masculine and apparently the implications have escaped the authors of the website. The same is true for certain portals accompanying B2i, that have apparently not been screened regarding gender issues.

## 5 Discussion and perspectives

One of the limits of our study is that we performed an in-depth analysis of a limited sample of textbooks, mainly from one publisher. However, this publisher has been present very early in the field of *technologie* and occupies there a very privileged place. Moreover, our sample covers almost all the history of the discipline and it and gives us a view of what developed since 1985 in the different grades of *collège*.

In this sample, authors have generally paid attention toward presenting gender-neutral contents. An explanation may be found in official prescriptions: equality between girls and boys is a legal obligation for the French educational system.



A convention aiming at promoting equality between boys and girls, men and women in the educational system was signed on Feb 25, 2000 between the main ministries having a common interest for education. It states: "the Education system nowadays needs to go further and define a global policy for equal opportunities for both sexes from pre-elementary school to higher education, from initial training to lifelong training"<sup>5</sup>. Schools are therefore invited to develop awareness-raising activities. Every student has to acquire and develop during his compulsory education respect for the other sex and to avoid stereotypes. So publishers broadly follow policy requirements.

Regarding on-line resources, the situation is similar. Institutional websites seem to be well controlled, while some others reveal signs of gender bias. But what exactly is the role of these resources is still unclear.

Overall, if the content of resources is certainly very important, it is obviously only a part of the problem. Much depends upon the usage of these resources and upon the teachers choices. Research has abundantly shown that they play a crucial role for relaying or combatting stereotypes.

Thus, far beyond resources, we should consider the role of teachers for deconstructing gender stereotypes related to information and communication technology, in order to enable girls to project themselves into these occupations. From this perspective, the fact that the proportion of male teachers seems to be steadily rising in technology is a concern, even if male teachers may be very attentive to gender equity. In this respect, what happens in teacher pre-service education seems to be a relevant field of inquiry and a pertinent lever for promoting equity in education.

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[6.pdf](#)

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## **7 Annex: sources used for this study**

### **7.1 Textbooks :**

1. Baron J-M. & al. (2003). Outils et notions. Technologie, 3ème. Paris : Delagrave
2. Baron J-M. & al. (2007). Outils et notions. Technologie, 3ème. Paris : Delagrave
3. Barras C. (1999). Technologie, 3ème. Paris : Fontaine Picard
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### **7.2 On-line ressources**

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Pagestec : <http://www.pagestec.org/> (08/27/2009)

Portal Educnet : <http://www.educnet.education.fr/bd/urtic/technocol/index.php> (08/27/2009)