PREDIL

Promoting Equality in Digital Literacy

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ICT in education from a gender perspective

Main results and research perspectives

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Summary

Executive summary

This document belongs to the category of snapshots realized in order to prepare for action. Such texts, as any state of the art, are doomed to quick obsolescence, since new papers keep flowing in. Furthermore, they have to be tailored in order to suit specific conditions, those of the project they have to prepare. In our case, we had to identify issues both of common interest for the members of the consortium and liable to be studies *within* this project. As a consequence, this state of the art has been designed and written in an iterative way, with a first version in June 2009, circulated for comment among partners. In particular, the national reports (of which executive summaries are annexed to this report) have led us to reconsider certain details.

One of the main difficulties of our task has been linked with the very object of our study, ICT. In effect, it is manifold and, for research purposes, has to be deconstructed. In the society, ICT is organized around three main attractors: what is relative to programing and algorithmics (that is often stereotypically considered as rather masculine), what relates to clerical work (word processing, use of spreadsheets for clerical purposes, which is rather related to female work) and what pertains to the domain of computer- mediated communication, which is sometimes associated with femineity, but where no clear stereotype has yet emerged…).

A series of well described facts are both interesting and difficult to analyze:

- ICT tools are very flexible and do not lend themselves to the same usage according to the context. For example, spreadsheets may be instruments for learning mathematics, allowing more experimental ways of learning them. They may also be taught as such in some vocational itineraries (eg for accountants). Nor activities nor emerging stereotypes will be the same in each case.
- Everywhere, there is a substantial gap between what youngsters experiment in the home and in social contexts and the kind of activies that are expected from them in the school. The nature of this gap obviously varies with age. Adolescence is a crucial moment, with its dynamics of identity construction and its urge toward transgression, typical of this period.

- There is a real diversity between countries in the way ICT is considered in national societies. Sometimes, there are specific curricula at school levels and sometimes ICT is supposed to be integrated within the different subjects.
- There is also a huge diversity between schools, even in the same country. Situations vary according to the kind of studies they offer.

Available research shows that gender-related ICT stereotypes actually exist, but there is no clear evidence of gender-differences regarding ICT usage and there is a large spectrum of situations according to women. Fully fledged stereotypes have not had the time to grow.

Yet, there is a great asymmetry of itineraries according to the gender, and it is well established that interactions with computers within schools vary according to the gender. In particular, boys sometimes tend may be over confident, while girls tend to under-rate themselves.

The construction of these differences is a long process and depends upon a large spectrum of factors. Those factors are relative to the society at large (according to the degree of enforcement of policies aiming at favoring gender equality), to the experiences lived at home and in the school. Separating these factors is an almost impossible task and the evidence on such issues is often either weak or contradictory. ¨Four perspectives have however been identified, leading to a series of questions, to which research may bring elements of response:

1. *How do teachers perceive gender in relationship to ICT use?*
2. *How do pupils (of different grades) perceive ICT now and as in a future perspective?*
3. *How do female and male pupils perceive ICT with respect to their future careers?*
4. *How do contextual factors influence engagement with ICT(facilitating of hindering).*

Annex 1 presents a list of bibliographic references. Annex 2 precises the research protocol to be followed and Annex 3 gathers the executive summaries of the different national reports.

1. Presentation of the study

1.1. Origin, aims and scope of the project in a nutshell

PREDIL is a COMENIUS project situated in the continuity of previous projects aiming at studying issues related to gender and mathematical education and at proposing solutions.

1.1.1. PREMA 1 (2005-2007)

This project has aimed at deepening "understanding on the factors that require attention in order to reduce the gender difference in mathematics and the emerging digital divide to the benefit of girls"[1].

This project has amply confirmed that maths and science learning may be achieved by girls, provided they have favorable conditions and that dominant stereotypes have been combatted. The preceding projects have confirmed the crucial importance of stereotypes and one of their main outcomes has probably been to analyze how their formation could be hindered, in particular by relying on teacher agentivity. This has given lieu to a second project, PREMA2

1.1.2. PREMA 2

This latter project has aimed at elaborating a gender sensitive curriculum framework for pre-service mathematics teachers[2].

During these projects, the focus has been on mathematical teaching, but we have also looked at what ICT instruments permit regarding a more experimental approach of mathematics. ICT, in effect, is interesting because it is both scientific and has not yet given rise to sharply defined stereotypes. Besides, ICT is a composite field, which encompass matters like programming as well as communication activities using specialized software and the use of instruments rendering possible more experimental approaches to abstract subjects.

1.1.3. PREDIL

PREDIL aims at better understanding the processes underlying the great imbalance in the take up of ICT by boys and girls at school and university. PREDIL also aims at developing a coherent and comprehensive gender sensitive pedagogical strategy, supported by a self-

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[1] http://prema.iacm.forth.gr/main.php.

[2] http://prema2.iacm.forth.gr/main.php

reflective framework for inservice teachers. it is built on the premise that "evidence-based pedagogical strategies can prove catalytic in increasing both the quality of educational provisions and the educational outcomes as well as foster pupils' motivation to STEM and related choices for careers". Its principal specific and operational objectives are the following:

1. To define a research methodology for capturing pupils' ICT representations (cognitive structures, processes, relationships) and teachers' experiences on media education.
2. To map on to pupils' ICT representations, practices, preferences and appreciations- both from a product and process perspective.
3. To establish an on-going discourse with practitioners on the current pedagogical uses of ICT from the integrated model perspective
4. To design, test and validate diagnostic self-observation/reflection tools for teachers.
5. To articulate a sound pedagogical strategy on the use of ICT in classroom practices from a gender equity perspective.
6. To share and reflect on the knowledge and experience gained in PREDIL with researchers and practitioners in the contexts of an on-going discussion forum, workshop and publications.

Given that gender is multiple, dynamic and that gender practices change faster than gender stereotypes, PREDIL's long term impact is on the equitable access of girls to the acquisition of competencies for living and working in the digital age. In the short term the impact is on the improvement of teacher classroom practices through a self-observation/self-remediation approach.

Very soon in the project, we agreed on the fact of launching several lines of research, adopting mixed methods: a quantitative study (online questionnaire), qualitative studies (focus group and interviews) and *corpus* analysis (ICT resources for teachers and students).

Within this framework, this position paper aims at:

1. Realizing a state of the art about these issues,
2. Defining perspectives for the empirical research part of the project.

In sum, this paper intends to identify relevant indicators and processes that underpin gender differentiation regarding ICT.

1.2. Methodological choices for the state of the art

Several lines of action have been simultaneously followed:

- We have led a systematic literature review, in order to find out what is the state of the art regarding ICT, gender and youngsters.
- We have also tried, with the different partners, to identify interesting research tracks.

Concerning the literature review, we did not start from zero, since we had frequently met the case of ICT when working on the learning of mathematics. We have started with the base of references we had, looked up references made within those papers to topics we considered important and led systematic studies in the main scientific databases. What seemed to us to be important has been added to the bibliographic database we have been maintaining for several years on a specific server[3].

There is in fact a great abundance of literature in the field we are studying. We could not take into account all empirical studies realized in the field. We have therefore paid a particular attention to a series of meta analysis and literature reviews that have been previously published, considering various aspects of the issue.

- Concerning the delicate issue of gender as a process, we relied very much on the seminal work of Howe (Howe, 1997). She analyzed in particular in chapter 4the case of group-work with computers.
- We also draw upon the work of the French sociologist Josiane Jouët (Jouët, 2003), who published an analysis of research about gender and communication technologies.
- Barker and Aspray, in a remarkable meta analysis, studied the factors playing a part in the differential orientation of boys and girls in ICT education and careers (Barker & Aspray, 2004).

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[3] Http://prema.paris5.sorbonne.fr/wikindx3

- Regarding the employment issue and, above all, the issue of women under representation in engineering, a key element, Prieto provided an enlightening synthesis (Prieto et al., 2009)
- Specifically about ICT and the school, Sanders (Sanders, 2005) presented a very detailed analysis of the different factors that may account for variability between males and females regarding ICT in the school.

We also relied on thematic bibliographies: (Gardey, 2004), (Dagiral, 2006).

In the same time we performed the literature analysis, we also launched collateral studies, in order to hear the practitioners' voices. Focus groups were organized, joining researchers and STEM teachers, in order to elicit important issues.

In what follow, we have chosen to first clarify what is relative to gender and then to ICT. Then we propose what seem to us to emerge from the literature.

1.3. A necessary deconstruction

Neither gender, education and even ICT are simple and consensual concepts. Among them, gender is perhaps the one where consensus is the most difficult to reach.

1.3.1. Gender

Heated debates have been going on about gender for several decades, in particular in the feminist movement. At the essentialist point of view is opposed the idea that gender is socially constructed. Many approaches of gender in history, psychology, sociology and ethnology, philosophy have been developed, but they are not so many in education sciences. In this domain, gender is often assimilated to “girls” and “boys” as students, and “men” and “women” as teachers, without integrating any sociocultural dimensions. Many studies where gender in this sense is associated with other variables may be found: in the USA, for example, with ethnicity or the social milieu for example; in France, with the socioeconomic environment of the family.

More than twenty years ago, West and Zimmerman invited us to distinguish between sex, sex categorization and gender. They argued that

> *"While it is individuals who do gender, the enterprise is fundamentally interactional and institutional in character, for accountability is a feature of social relationships and its idiom is drawn from the institutional arena in which those relationships are enacted. If this be the case, can we ever not do gender? Insofar as a society is partitioned by "essential" differences between women and men and placement in a sex category is both relevant and enforced, doing gender is unavoidable" (West & Zimmerman, 1987, pp. 136-137).*

Gender is therefore a difficult concept to cope with and and it is both beyond the scope of this paper and beyond our own competencies to discuss it in depth. We'll mainly treat it as a bi-categorial variable, but we shall try to illustrate the shortcomings of this bi-categorial division between males and females and consider different dimensions of research, notably qualitative research.

1.3.2. A gender digital divide in debate

A gender digital gap (or gender digital divide) has been observed by some researchers, but contested by others. Now, if we consider that access to ICT has an impact on experience, and experience an impact on attitude and achievement, we may observe a first causal chain increasing the disadvantages of girls and women. The situation, however, may be more complicated since this digital divide is not only related to access but also to different types of usages of different types of software in different situations.

In the socio-psychological domain, Cooper and his team have developed, from 1990 to 2003, a series of studies in the United Kingdom about the "Digital Divide", year of the publication of "*Understanding the Digital Divide*" (Cooper & Weaver, 2003).

In "*Gender and Computing: Persisting differences",* Durndell and colleagues remarked that:

> *"The persistence of gender differences in the area of subject choice at school and in higher education continues to provoke concern. The concern centres, in particular,on the 'gender gap' associated with the underrepresentation of women and girls on courses and in careers in science and technology. (...) There is some evidence, however, that the gender gap in computing in general is not as straightforward as it might first appear". (Durndell, Glissov, & Siann, 1995, p. 219).*

The idea that different kinds of digital divide does exist (and not only regarding ICT access but also ICT usage) has been reported for some time (Hargittai, 2002). And a gender divide

has been well identified, manifesting itself in different domains: games, styles of communicating, but also employment.

Hafkin and Huyer, in a 2008 paper analyzing statistical data all over the world, found that:

> *"As we have noted above, comprehensive sex- disaggregated ICT data across many countries do not currently exist. However, the data on access to and use of ICTs that are available indicate that women's participation in the information society, particularly in the poor countries of the world, lags behind that of men. What is not known, though, is the magnitude of this divide, its evolution, and its many nuances—all are matters of importance for the design, implementation, and evaluation of programs" (Hafkin & Huyer, 2008, p. 33).*

Is the ICT gender gap really narrowing? This issue is not easy to study, because the very metaphor of gender gap is misleading. There are, in fact, as has been previously said, a series of technologies, of situations and, rather, several *contrasts*.

1.3.3. ICT in an educational context

a) Several types of ICT for education

In the field of education, ICT is something embarrassing: too wide, too heterogeneous, evolving too quickly. What exactly have in common using popular communication technologies like MSN, chat or forum systems, now widely available to discuss with friends, research engines allowing to easily search on the web and retrieving data in order to achieve an assignment, word processors, so convenient to write this assignment and include in it multimedia material, spreadsheets helping to solve statistical problems or using a learning platform? The impacts on these tools on learning are very different and, henceforth, no general answer can be given.

Therefore, caution is in order when trying to encompass what ICT is in education. We shall rely on concurrent works pointing at the following great classes of ICT usage :

1. Educational technology, where technology is mainly the teacher's tool and where learning objects and resources tend to guide the user
2. General purpose software (word processors, spreadsheets, search engines…)
3. Specific subject-matter related software, more or less "didactized".

4. ICT as an object of learning.

Another issue has to be discussed: to what extent observations made 20 years ago are still valid, now that technology has evolved quite a lot?

Obviously, the dissemination of the Internet has changed things quite a lot and new ways of communicating have become commonplace. The need and the place of programing within the global field of ICT have rather dwindled. On the other hand, if the kind of technicity required for operating a computer has evolved, technicity is still needed and ideas evolve quite slowly. Perhaps, one of the key idea is linked to what we might call, following Martinand the "register of technicity" (Martinand, 1994) of the different artifacts used, which clearly remains gender-related.

b) Various conceptions of ICT across Europe

It is worth remarking that ICT does not represent a single reality in European school systems. It may be present in the national curriculum as a set of requisites (like in the United Kingdom or in France) or be part of local curricula. It may be taught as a specific subject (like, for example in Greece and Slovakia), or represent only something that has to be integrated in the other subjects (like in France, in Belgium…). In this case, it may be only really taken into account by some subjects (like mathematics, technology). More precisely, it will be present under a host of different forms that do not have the same rapport to gender issues according to the different cultural traditions.

For example, regarding France, algorithmics is currently being introduced in the mathematics syllabi of the first year of senior secondary education[4], manifesting the old proximity of mathematics with ICT. At the same time, ICT instruments like the spreadsheet have been present for a long time in the curricula of technical subjects like administration, where girls are a majority, seem to pose no special problem to them. In scientific subjects, on the other hand (eh mathematics and physics), the spreadsheet is associated with different objectives and is probably not used in the same way. Annex 3 presents a synthesis of the results presented by the different partners in their national reports.

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4 http://eduscol.education.fr/D0015/consultationMaths_2nde.pdf.

These differences in curricula and finalities of the teaching are really important and render any comparison difficult.

Just to give an example, a recent report (Gras-Velazquez, Joyce, & Debry, 2009) entitled: "Women and ICT. Why are girls still not attracted to ICT studies and careers?" gives results, coming from a European survey led in 14 secondary schools of 5 European countries, with a rather generalizing tonality. A simple glance at the methodological part (p. 21) shows that things may be more complicated. In 3 schools out of 14, the exact number of boys and girls surveyed is not available. And the ratio of girls vary hugely according to the schools. For example, in the 3 Polish schools, it is respectively 39 vs 687, 341 vs 173 and 52 vs 490. It is extremely probable that these differences reflect different itineraries and, hence very different experiences, attitudes and representations toward ICT, that are completely erased when averages by country are computed..

One of the heart of the debate is probably the opposition between a rather male scientific side (where algorithmics and programing are central) and a technical side, where beyond the objects, the same flexible software tools may be used either in traditionally male or female stereotyped contexts.

One key problem is to understand the role played by ICT in the orientation of students towards more or less prestigious academic careers. Another key issue is to study how teachers may use ICT means in a gender-sensitive way.

c) Laptop operations in secondaries school

Since the early 2000s many local authorities around the world have set up projects aiming at equipping secondary school students and teachers with laptops. Among the objectives for creating an environment saturated with ICT, has often been the will to contribute reducing the digital divide. It is still too early to measure the impact of these politics on the choice of itineraries but giving a laptop computer for the several years of compulsory education may contribute to gender equality, at least regarding ICT access and perhaps, motivate girls to follow ICT related itineraries.

2. Teaching and learning with / about ICT, gender aspects

2.1. The importance of stereotypes

In 2003, Josiane Jouët made a landmark synthesis on the research about gender and communication technologies. She proposed to study the links between ICT and the society, remarking 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" (Jouët, 2003).*

For her, new possibilities are opened by communication technologies that "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).

Remarking 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 2003, we have found both a growing interest for studying gender differences regarding the appropriation of technology and a limited number of studies devoting themselves to the specific case of young people.

For example, Sylvie Octobre (Octobre, 2006) has studied in France in 2002 the leisure of youngsters aged 6-14. Her study considered a sample of over 3300 subjects. In a paper published in 2006, She explained that the leisure activities are not the same for boys and for girls (video games tending to be preferred by boys and audio devices by girls, those latter tending to generate more exchanges). Parents contributed to different treatments by what they forbade: "parents are stricter towards boys about listening to music or radio and stricter towards girls about playing video games). The author insists on the crucial importance of

"socialization agents" (parents, teachers, the group of peers). She concludes on the pregnancy of intergenerational schemata regarding leisure choices.

To give another example, a study realized in France in 2004 with 445 students from 5 schools (UDAF 74 - Haute-Savoie, 2005) reports that if there was no difference concerning searching the internet, girls tended to use more email (52% against 32% for boys) or chat (55% against 42%). Boys downloaded more (47% against 25% for girls) and were more to say they played net games (36% against 13%).

In her PhD dissertation, Céline Metton has studied the process of becoming a grown up. Her study, which is focused neither on gender nor education but on the process that takes place at adolescence, also considers gender issues and problems of education. She considered pupils in a junior high school, in their family and in holiday camps. Remarking that communication technologies offer a space of autonomy to adolescents, she found the presence of common stereotypes (a predominantly male technological sphere and a predominantly female communication sphere).

> *"The family thus appears as a world in which traditional roles attributed to men and women infiltrate themselves in the use of communication technologies and participate to the construction of cleavings… Of course, one should not reduce socialization to a mechanical process of confrontation to exemplary models of social behavior fit for both sexes. But it is certain that the difference in values and prescriptions in the education of both sexes appears in the models given by parents in the modalities of their interventions and in the nature of parent-children interactions" (Metton, 2006, pp. 225, 226).*

In France, Duru-Bellat, Kieffer and Marry have proposed to interpret this process as a phenomenon called "*double handicap des filles*", this "double handicap" consisting in the gender and the social origin (Duru-Bellat, Kieffer, & Marry, 2001).

Within the field of sociological studies, the utmost importance of ICT in the domain of youth sociability has been recently underlined: for example (Fluckiger, 2006).

2.2. A great asymmetry of itineraries and careers

The great under-representation of females in the scientific itineraries and careers underlined in the PREDIL project national reports concurs with the main research results so far reported.

In a report to a joint enterprise of the United Nations Conference on Trade and Development (UNCTAD), OECD and the International Labor organization (ILO), Montagnier & Van Welsum confirmed the persistence of a great asymmetry between men and women in the workplace :

> *"There are significant differences between women and men in ICT-related employment, with women having low shares of employment in ICT specialist occupations (e.g. software engineers, IT specialists) and among intensive users of ICTs they are most heavily represented in office and secretarial occupations rather than professional ones" (Montagnier & van Welsum, 2006).*

Furthermore, "These differences are also a reflection of educational patterns, with women tending not to go into ICT education to the same extent as men".

Differences are particularly preoccupying in the field of engineering. A European project, WOMENG (Pourrat, 2006), led between 2002 and 2005 made a comparative study of women's choices and careers as engineers in Europe regarding engineering. Not very surprisingly, they found that "Most women choose engineering because of interest in maths and sciences at school, or especially where engineering is a high status career, because of good job prospects, salary and social standing" (p. 116).

But they add (p. 117) :

> *"We have found that in general engineering students want personal, social and intellectual satisfaction, that salary is not a key factor for women. Some women students are already concerned about work-life balance and about combining family and careers, particularly in France but many others are confident it will not be a problem. Few male students have considered these issues" (p. 117).*

Regarding the employment issue and, above all, the issue of women under representation in engineering, a key element, Prieto et *al*. recently concluded, from an analysis of literature, mainly considering reports having a statistical basis :

> *"One of the most striking similarities found in most reports and articles is that they focus on the symptoms of the underlying problem, and they canvass but do not move to examine the causes, for example why it is that not enough students are taking science and maths in secondary school. What we do get from all the reports is the multi-dimensionality of the problem (...) We have reached a point in this ongoing debate where we need to establish with accuracy the degree to which the different factors influence decision-making when it comes to enrollments in engineering tertiary studies and how they are linked." (Prieto et al., 2009, p. 194)*

Two American researchers published in 2006 a book entitled *Women in Information technology. Research on Underrepresentation*, presenting their objectives *:* "look reasons for the persistent gender imbalance in computing and explore some strategies intended to reverse the downward trend." (Cohoon & Aspray, 2006). This title reflects the permanent question of the underrepresentation of women in careers in computer sciences or in the domains linked to ICT. In France, (Schuh-Collet, 2005) studied the same issue in her PhD dissertation.

For explaining this underrepresentation, quasi similar causes have been found in the different contexts. They essentially concern the conception and reality of the place and the role of the females in the society, as show the minor difference in files such as medicine and natural sciences? But also management and economics. If we want to analyze the links with ICT, we have to take into consideration the manifold nature of ICT and the type of needs of the different professions and careers regarding:

- Technical matters such as software engineering, system and network administration, hardware maintenance…
- Multimedia design involving some form of programing (eg in Flash), but also more artistic design.
- Office work, with software like word processors, spreadsheets, etc.

As is confirmed by many studies, professional fields are often gender-stereotyped. So are the typical tools they use. Gardey, for example, reminds us that:

> *"Typing, stereotypically regarded as women's work was originally performed by male stenographers in a context where practically all the positions in an office would have been occupied by men. The narratives of Balzac and Melville remind us that in the 19th*

> *century the world of the office was exclusively male, and that this state of affairs was regarded as quite natural at this time (...) What seems to be needed is an analysis of the way in which identities associated with gender and social roles are inter-definitional, as well as the way in which inversions come about and lead to new definitions of social relations between the sexes, which in turn congeal to form new unquestioned states of affairs. We have already posed this question, which makes just as much sense at the level of the history of a profession, in earlier work about office workers as a whole" (Gardey, 1999, p. 322)*

Professional fields are not gender neutral. There are representations of gender trades that may interfere with the skills of pupils and students (Vouillot, 2007). Careers in education are those trades that now require ICT skills, although this was not always highlighted.

This is also the case for the domain of teaching, which has a special importance for youngsters, since teachers play an important part in their development. We'll therefore now consider what has been found on the role of school in general and of teachers in particular regarding ICT from a gendered point of view.

2.3. Male-female interaction with ICT environments

The question of access to hardware in the school has been the first to be posed, at a time when hardware was rather scarce. It is still a problem when computers have become rather commonplace. For example, Rinaudo & Delalande, studying the free use of computers in two French lower secondaries schools found, through a qualitative study completed by quantitative data, that, in practice, "boys always outnumber girls in the specialized computers rooms. Sometimes they was no girl at all in these rooms (Rinaudo & Delalande, 2008, p. 136)

In practice, even when computers are an easy resource, working in pairs or in groups of students remains frequent and is even advocated in the name of socio constructivism. So, many studies have been led on this subject.

When girls and boys are working together with computer, what happens? The interactions between students and between students and teachers, and their influences on attitudes and experience are the subject of many studies. We shall give some examples. Howe (Howe, 1997) has published in a review of literature on "*Gender and the classroom"* a chapter entitled "*Group Works Around Computers"*. After presenting some surveys on groups, she

observed that gender is not taken into account as a variable, and that "studies are rare. She explains this phenomena as consecutive to the researchers' projects. A part of her review is devoted to the interactions, in term of "gender differences".

An analyse of interactions between 66 students (11-12 years old) working on a computer on a novel problem-solving task showed that there are few relations between the composition of the pairs and the results of the students. But patterns are different in the different cases:

> *"The different gender pairings did produce different patterns of interaction (with, for example, marked dominance patterns in the mixed pairs), but the substantial advantage of boys over girls in terms of final performance turned out to be largely independent both of pair type and of the verbal interactional measures used." (Barbieri & Light, 1992).*

In an "overview of several research projects involving groups working with science simulations", Scanlon studied the "most productive way of forming groups to work at the computer on science simulation" (Scanlon, 2000).

In the past decade, the offer of distance learning, has been growing. Furthermore, new modalities of learning, associating in presence courses and distance education, based on the use of internet instruments, have been developed. Some news questions have appeared regarding distance education, particularly about computer anxiety, or differential drop-out rates. In many cases, however, sample sizes are modest, which limits the significance of results.

In a paper published in 2003, involving a longitudinal study and considering large samples of students, Gunn and her colleagues expressed the interesting idea that domination and difference should be distinguished and that confidence does not equal success.

> *"Knowledge of contemporary research findings together with the benefits of past experience provided the basis for initial assumptions that female students might perform better on the research assignment because it involved communication and teamwork, while males may do better on the technical task of website development. However, these assumptions proved to be unfounded as the female students performed consistently better than males on both tasks. Analysis of course entry questionnaires showed that females rated themselves less competent with Internet skills and experience at the outset (...) Analysis of participation in online activities recorded by the course management system*

server then raised the possibility that male students may be over-confident in their ability and think they do not have to put in as much effort to meet the course requirements" (Gunn, McSPORRAN, McLeod, & FRENCH, 2003, p. 23)

Students, both male and female, usually spend a lot of time playing computer games and this activity deserves an analysis.

2.4. Games and serious games

Games are important, for three reasons: one is that both girls and boys have been gaming since their young age, but not equally; secondly, games contribute to enhancing girls and women in the ICT careers; thirdly, games begin to be considered as possible ways of learning and teaching.

2.4.1. Relying games with experience, and experience with attitudes and self-confidence

Many statistics and studies insist on the fact that boys and girls do not have the same behavior with games. Colley and Comber relied games and experience with computer. They compared results of studies in 2003 and 1990, and showed that gender gap is reducing, but some differences persist, particularly because boys game more than girls, what is increasing their experience with computer (Colley & Comber, 2003).

2.4.2. Games for enhancing females in ICT careers

Games are in their majority practised out of the school, both by boys and girls. But it has been claimed that they can be a means to lead students to more formal learning in the classroom and encourage students toward careers in the sector of ICT. For example, (Hayes, 2008) based on a survey led in 2006 on more than 1 100 students in the Midwest of the USA found that the engagement in game creation was associated with a perceived proficiency with the classical IT tools, whereas there was no significant difference between those who used (and did not use) keyboarding and word processing (p. 103).

The presentation of the significant book *From Barbie to Mortal Kombat: Gender and Computer Games* emphasizes "the complicated issue of gender in computer games particularly the development of video games for girls" (Cassell & Jenkins, 1998). Ten years after, and with a title referencing to the first book, the question tends to move to "how to involve girls and women in games?", even if the game's industry is "male-dominated" (Kafai,

Heeter, Denner, & SUN, 2008). Females' dislikes have been studied in Germany, with applications to video games design (Hartmann & Klimmt, 2006).

Research about gaming is abundant and has explored representations and stereotypes present in video games, as well as the effects on learning and on the current attitudes.

2.4.3. Gaming in a pedagogical context

Gaming is a way for increasing experience, and games are increasingly considered as a possible way of learning. Games, and particularly serious games are involved in pedagogical contexts. How are they used in the school? The Interactive Software Federation of Europe entrusted a big study during one year, at European Schoolnet, concerning the use of electronic games in the classroom (Kearney & Wastiau, 2009).

A report on “games as resources to support the educational aims, objectives and planned outcomes of teachers” was recently published in United Kingdom (Williamson, 2009).

3. Discussion and perspectives for the PREDIL project

One of the major difficulties encountered in analyzing issues related to ICT, education and gender lies in the fact that, as confirm the synthesis of national reports annexed to this document, ICT takes many forms in education. Furthermore, it evolves very quickly, too quickly for educational systems to be proactive. Some aspects of ICT are closely linked with mathematics (like algorithmics) and hence tend to share with them gender-related stereotypes. Some other aspects are technical, and closely linked with specific families of software. They inherit from the professional world in which they are used, a series of stereotypes, sometimes apparently contradictory because software is flexible (one of the most interesting cases being spreadsheets). Finally, some other aspects of ICT are probably not yet subject to well established stereotypes: they are *epicene*. This is probably the case for blogging or chatting.

Youngsters use technological instruments liberally outside of the school, and their "private" practice shapes their representations. But the school also plays an important part in this respect and, most of all, educates them to a culture, which is far from being stabilized. In this context, teachers have a crucial influence, inasmuch as they disseminate "good" references and serve as possible models.

Starting from these facts, we have chosen to study four questions.

3.1. Research choices and methodological choices

We have decided to follow 4 main lines of research

1. Understanding the national contexts
2. Understanding student choices, at the critical points where choices of itinerary have to be made.
3. Understanding teachers' practice
4. Understanding experiences of ICT

From a methodological point of view, we have chosen to use mixed methods: we concur with the ideas expressed in the WOMENG project (Pourrat, 2006, pp. 12-16). In such a European project, with seven partners coming from countries with 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).

The following principles have been agreed upon by the partners:

Qualitative and quantitative methods would be used in order to both identify contrasts and explain them.

- Carefully distinguish between different uses of ICT: using general instruments, blog creation, websites traffic, twitter, Facebook, but also educational technology and specific ICT teaching …
- Define common tools for data collection by an iterative process.

3.2. Main qualitative studies launched

It has been agreed that several studies should be launched at the same time by the different partners. Three of them were compulsory for everyone: the study of the offer of resources available to students, both textbooks and teachers' portals and interview with computer science or engineering advanced students. Other qualitative studies could be launched according to the specific situation of each country and to the preference of partners. We only present here the main strands of research launched, for which results are included in the different national reports.

3.2.1. Studies led by every partner

a) Resources and portals about ICT for students

The idea to study resources (including textbooks) and portals stems from the previous idea of studying the offer of textbooks. In effect, such resources are liable to influence the way students perceive ICT. The framework used is presented in annex 3.

b) Elicitation of itineraries by students

The main goal of these qualitative studies is to obtain narrations about choices being made by students having chosen ICT as their career.

- Computer science students at an advanced level (master of Phd)
- Fresh(wo)men in mathematics and computing
- Students in communication and multimedia
- Pre-service teachers

c) Focus Groups

Focus groups have played a part in helping develop an understanding of main issues as teachers see them and to test the online questionnaire. We have used the protocols presented in annex $$..

3.2.2. Other studies

a) Report Cards

In a first time, and basing ourselves on previous work (Sarrazy, 2001), it has been thought that we might get information from the verbal evaluation teachers produce on students at crucial moments in the curriculum when choices of itineraries have to be made. The STEM (Science, Technology, Engineering, and Mathematics) teachers' appreciations and evaluations of both girls and boys in the 1st year of the higher secondary (the year in which key decisions are made) are liable to produce interesting data, which might be analyzed in order to relate the gender of the teachers to their evaluations of the ICT competencies of girls and boys. Grades and teachers' recommendations would be taken into account. Mathematics have to be considered because their impact on orientation is more important than technology. Mixing qualitative and quantitative entries would generate 'word clouds' and attractions between variables (so the word cloud of all the male teachers could be compared to the world cloud for the female teachers, for example).

However, the discussion between partners and pilot studies led in France suggested that this approach was not suited for every partner. Furthermore, contrary to what had been hoped, it proved relatively difficult to obtain data from schools. Those we could consult produced relatively stereotyped appreciations, with no clear relationship to gender. This line of action will therefore be tried only where it seems feasible.

b) Scenarios

It has been suggested that it might be extremely interesting to design a simple scenario for a common task, to have it tested and the results analyzed in the different participating countries. This issue, which offer good perspectives for getting new research results, needs further reflexion from the partners.

3.3. Quantitative studies

A good deal of reflection has been devoted to the elaboration of instruments for acquiring data about students' choices and ICT practice. It started from the PISA and the Gender awareness in media education - G@ME[5] questionnaires. Those questionnaires have as an advantage to have been translated in several different languages. But they do not allow to shed much light on research theme #2: *Understanding student choices, at the critical points where choices of itinerary have to be made*. Several possible variations have been tried and finally an hybridization has been made with the kind of questionnaires previously in a previous projet: PREMA[6] (see annex 4).

The final form of this questionnaire will be determined after test have been performed in the different countries.

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[5] http://www.project-game.eu/diagnostics.php.

[6] http://prema.iacm.forth.gr/

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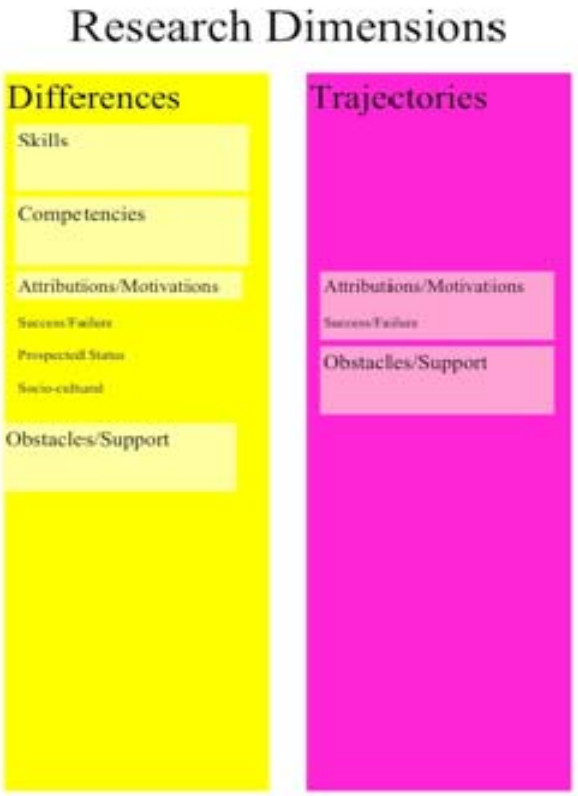
6. Annex 2: PREDIL Research protocol

6.1. Research dimensions



6.2. Resources and Textbook analysis protocol

6.3.1 Corpus to be analysed:

All relevant books in the field of technology teaching at the relevant key stage. There is a potential problem here. In effect, the status of technology in school (as a school subject or as something that has to be integrated elsewhere) greatly varies according to the different countries.

6.3.2 Rationale:

Try to find within the textbook representations revealing asymmetric relations between the social categories of male and female.

These asymmetrical relations may be inscribed in images of persons bearing indices of social sex. They may also appear in the text of activities, either lessons or exercises.

We should look systematically for gender biases, first in the illustrations, then in the text.

We should describe each of the item by a series of indicators aiming at identifying discriminations against either of the sexes, then conduct some statistical analyses.

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6.3. Focus Group Protocol for the TEACHER Focus Group

6.3.1. Scope:

These focus groups will have two main goals:

1. Obtain information on teachers' representations about the situation of ICT in schools regarding gender issues

2. Obtain help on the design of the online questionnaire, which will have to be elaborated well in advance.

Consequently, two sessions will have to be held.

6.3.2. Who:

6 teachers [ideally from different schools] with experience of teaching ICT

already a problem! Do we want *ICT teachers or teachers who use ICT in class a good deal?*

6.3.3. Where:

A room that makes discussion easy (whiteboard, table, comfortable seating…)

6.3.4. Resources:

An invitation to potential participants that includes a brief description for the participants (attached); a document to provoke comments (attached); administrative details; recording medium (digital recorder, paper, computer) for the group to use

6.3.5. 60-90 mins

6.3.6. Preparation:

Identify participants; communications; assemble resources (including multiple copies of all the materials you have sent, for the people who forget to bring them along!). Organise refreshments. Send out materials a week in advance.

6.3.7. Script:

Introduce: participants to each other, ask for a brief biography from each person (10 mins)

Outline: the purpose of the meeting (5 mins max) – the main points are set out in the letter of invitation.

Invite: comments on experiences using the tool (5-10 mins per person)

- □□□□□ Are the headings the right ones?
- □□□□□ Can the text be made clearer?
- □□□□□ Are the questions for the Observation Aspects the right ones?
- □□□□□ How might they be improved?

6.3.8. Letter of Invitation:

Dear xxx

Invitation to Join a Focus Group on Gender Issues in ICT

PREDIL is a pan-European project that seeks to address the imbalance in take-up of careers in ICT between men and women. The current imbalance has two important drawbacks. First is that a key industry might not be attracting the best possible workforce; second is that many women might be missing out on interesting and well paid careers.

We believe that some of the problem comes from girls' classroom experiences of ICT – this the topic for the FocusGroup.

We would really value your input into this group. We have planned a session that will last about an hour (say 60-90 mins), to be held at zzz.

Your commitment would be to read and try out activities in a document designed to provoke reflection on classroom process, then to discuss ways to improve it, during the focus group.

We will pay for travel, and will provide some refreshments. The meeting will provide an opportunity for an informed discussion with knowledgeable colleagues. We hope you can join us!

Please send an email to confirm your willingness to attend to zzz. We will send you full details about the meeting, and a map.

I look forward to seen you on zzz.

Best wishes

6.4. Protocol for studying Report Cards at the end of the Academic Year

6.5.1 Hypothesis

For the same grade or mark, students will not get the same evaluative comments if they are male or female, in particular in fields related to ICT. Here we explore this hypothesis in detail by studying report cards written at a key moment of their studies: when they have to make choices about what they will study in the future.

6.4.1. Fields considered

Teachers who are in charge of technology or ICT. If possible Math teachers.

Pre service teachers during their training years will be fine.

6.4.2. Number of observations

Collecting reports from 3 male teachers and 3 female teachers. It would be satisfying to have overall the reports of at least 6 classes.

6.4.3. School level

Grade 9 or 10 in general education (15 to 16 years old students), when they are at the point of making decisions for their future.

6.4.4. When

During autumn 2009.

6.4.5. Nature of data that will be taken into account

- □□□□□ Written evaluation for each student
- □□□□□ Mark of each student
- □□□□□ Sex of the student
- □□□□□ Sex of the teacher

if possible:

decisions made by students for his next year orientation

decision made by the teacher council for the next year orientation of the student

6.4.6. Analysis

A simple examination of 4 different word clouds (teachers [male, female]*students[male, female]). Based on comments. This will form the basis for a typology of comments. We will then perform multivariate statistical analysis using this typology.

7. Annex 3: Summaries of the national reports

(October 2009)

7.1. France

7.1.1. Generalities about gender and education

The equality of girls and boys is a legal obligation for the educational system. The school coeducation is realized in the facts for schools and establishments since 1970's. But this school coeducation does not recover a situation of equality between girls and boys.

An agreement between many ministries for the promotion of the equality of opportunities between girls and boys, women and men in the educational system is signed for period 2006-2011. It reaffirms the necessity of developing a global approach in the whole of the educational approach, in particular within the orientation and the education in the citizenship.

So, establishments are invited to develop the awareness-raising activities and the trainings which can learn the respect for the other one. Every pupil has to acquire and develop during his compulsory education the respect for the other sex and the refusal of stereotypes. Establishments are incited to register this question in their internal regulations.

7.1.2. Educational policy in ICT

In the compulsory school system there is a certification of ICT competences, but there is no specific ICT curriculum, except in technical and vocational subjects, (BARON, 2007). The priority is given to the integration of ICT in various school subject.

Technologie has been taught under this name in French lower secondary education since 1985. One of the key elements of this 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.

Informatics has not been taught at higher secondary level 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

curriculum2). However, the government has preferred so far the integration of ICT contents (in particular algorithmics) within the mathematics curriculum.

7.1.3. Girls in STEM

According to the Observatoire des inégalités (2009), in high school, boys are much more represented in the scientific series, which leads to the most selective branches of higher education.

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).

Trends pointed in upper secondary schools are confirmed 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. Fundamental sciences were mainly followed by males especially at the master and doctorate level (INSEE, 2007).

7.1.4. Main qualitative research findings

Our main results of the analysis of a sample of textbooks in Technologie from 1986 to 2006 are that illustrations show more often men than women, with a differentiated social status : women tend to be costumers and men tend to have leading responsabilities. But, in recent textbooks, we've found awareness to gender issues and a tendancy to avoid stereotypes, and to present symetrical situations. Contents linked with ICT are generally neutral.

We analyzed a sample of 20 online resources from institutional portal in Technologie. They are produced by groups of teachers under the supervision of inspectors. This process is rather close to what happens for the textbooks. The resources tackles 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, specially when curriculum is just reformed and textbooks not yet published.

7.2. Germany

7.2.1. Generalities about gender and education

The German educational system is characterised by the responsibility of the Länder for the definition and implementation of educational policies and strategies. In general the curriculum approaches of the Länder are based on the same policies, e.g. on decisions of the Ständige Konferenz der Kultusminister der Länder (KMK, a committee of ministers for education and cultural affairs of each of the Länder). The principles of co-education and equality of women and men in education are embedded and specified in the education acts and curriculum frameworks of the Länder.

Concerning media education and information- and communication technology (ICT) in schools the BLK (1987) pointed out that all adolescents – girls and boy equally – should benefit from using new technolgoies in education.

It has to be noted that a the issue of gender in education (in relation to ICT) is addressed by a great number of single projects on Länder level and even on school level; however, the overall implementation of the principle of equality is in the responsibility of the Länder and differs accordingly.

7.2.2. ICT educational policy in a nutshell

According to the Bund-Länder Commission for Educational Planning and Research Promotion (Bund-Länder-Kommission für Bildugsplanung und Forschungs-förderung, BLK, 1995) media education aims at teaching media literacy to pupils. The focus is on an integrative and interdisciplinary approach across all subject matters. Basic education in information technology (Informationstechnische Grundbildung, ITG; see BLK, 1987) is to be implemented in all compulsory schools in Germany at lower secondary level by integrating it into existing subjects and/or offering the subject informatics (Informatik). The concept of media education and the subject informatics differs for each of the Länder concerning content and focus related to the age of pupils and the interdisciplinary integration in the curriculum.

The BLK (1995) points out that the competences of pupils often exceed those of teachers in the use of ICT and other media. Qualifying teachers for media education therefore should aim at increasing the teachers' media literacy and at the same time prepare them for teaching effective use of media in teaching.

7.2.3. Girls in STEM

At university level, women decided for subjects according to traditional stereotypes. They rather choose linguistic and cultural sciences, social science, or teacher training. Women are clearly underrepresented in engineering sciences. In Germany several initiatives and project aim at attracting women to study STEM subjects, e.g. information days for pupils, information services for women at university, and special studies for women only (Studien- & Berufswahl, n. d.).

Graduating in mathematics, and even more in information technologies and electrical engineering, is associated with clearly better chances for a swift job entry after university than graduating in mathematics teacher training or humanities (Briedis et al., 2008). According to Blossfeld et al. (2009) the number of women who work as teacher clearly exceeds the number

of men who work in the same profession and they are underrepresented in other professions which require higher education qualification. Apfelbaum (2009) reports an underrepresentation of women in IT professions; and female IT experts have an average income clearly below that of their male colleagues.

7.2.4. Textbooks and resources

The analysis of school books for informatics and information and communication technologies reveals that these materials often provide gender stereotypical contents. In many school books for these subjects, girls are under-represented. Both in the texts as well as on pictures their number is clearly below that of boys, and they are presented less often in leading positions and as acting persons. Yet, few exceptions are available, e.g. some books are designed gender-sensitive with regard to language and pictures and boys and girls are named and shown to a similar amount and in different positions. Preliminary analyses of online materials for pupils indicate similar results.

7.2.5. Interviews with teachers

The results of interviews with teachers provide insights that the achievements of girls and boys have to be analyzed very differentiate. There are always some boys who are extremely skilled in ICT in a class. Besides them, girls are more likely to receive very good achievements due to their very organized and very accurate style of working. Even if the other boys perceive themselves to be more confident in performing high level computer tasks than girls, they often pay less attention during the lessons, and this has often detrimental effects on their achievements that they score below the girls. Yet, these achievements are not reflected in course choices (if courses are on a voluntary basis): in general, more boys than girls select ICT courses at school and this pattern of choice was even observed for boys and girls from special "notebook classes" who are taught by using the computer in any subject. Teachers mentioned that it is crucial how far a teacher can support girls and encourage them to take up ICT courses at school. They considered female ICT teachers as an important role model and positive factor for girls' ICT choices.

Furthermore, it was also pointed out in several interviews that the ICT competencies of many teachers are far away from enabling them the application of ICT during lessons, also in STEM and other subjects. This means that teachers often don't know how to apply ICT in the classroom from a didactical as well as from a didactical perspective.

7.2.6. References

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7.3. Greece

7.3.1. Generalities about gender and education

The legal framework related to gender equality and the elimination of all kinds of discrimination against women was established in the 1975 Constitution of Greece. As is stated in the Greek Constitution, as revised by the 2001 parliamentary resolution: "Greek men and women have equal rights and equal obligations". Furthermore, "... all workers, irrespective of gender or other distinctions, shall be entitled to equal pay for work of equal value". On the basis of the Constitution, from 1975 until today a number of Laws have been passed by the Parliament to ensure gender equality in family relationships, education, employment, and social security. This led to the improvement of the position of women in the society although discriminations against women never ceased to exist.

Under the Greek Constitution formal education is the responsibility of the State. The Ministry of Education has the main responsibility for the planning and implementation of the education policy. The Greek system is characterized by the state's central control, although recently measures have been taken to devolve responsibilities to the regional level.

The basic aim of Primary and Secondary Education is to contribute to the holistic, balanced and harmonic development of the intellectual and psycho-kinesthetic powers of students, in order, irrespective of their gender and origin, to enjoy the opportunity to become fully developed personalities and live a creative life.

7.3.2. ICT educational policy in a nutshell

Since the mid 90s, when the first national large-scale initiative to include ICT in the daily activities of schools was launched, a number of initiatives/actions have been implemented so as to set up the necessary infrastructure (including networks[1] and portals[2]), provide training and support for teachers and develop appropriate educational material. Although the Ministry's orientation and aim is to perceive ICT as a tool to be used in every day teaching, learning and communicating and not only as an independent scientific domain, this is not the case in the vast majority of Greek schools. In has to be noted that teachers are generally

encouraged to use educational software (still the integration of ICT in teaching is not foreseen), but the existing school culture (teacher-centric, traditional practices, etc) and time barriers regards the use of ICT as an "innovative approach". The assessment system and process from secondary to tertiary education however does not leave much space for innovative practices. In addition the existence of computer labs in schools –with a responsible teacher, is still another constraining factor to the emergence of innovative teaching/learning practices. Thus, ICT is basically present in secondary education as "the subject of Informatics" –taught as a compulsory course in gymnasium (and as optional in lyceum), with the aim to familiarise students with the basic ICT tools and applications. To the credit of "innovative teachers" it should be noted that there are a few cases where ICT is integrated in the curriculum, without however any substantial levels of sustainability and certainly scalability.

Digital convergence is among the current policies and goals of the Ministry. The aim is to enhance equality of access, reduction of digital illiteracy, development of new technology distance teaching, etc. –the Ministry's latest initiative being the provision all entering lower secondary school pupils with a free laptop computer at the beginning of the 2009-2010 school year.

7.3.3. Girls in STEM

The annual studies regarding the use of ICT in Greek households show an increase in the use of computers and Internet for both men and women. Although the percentage of use by women grows faster than that of men there is still a significant gap between the genders –that seems to get smaller as time goes by. It is worth mentioning that in the young cohorts gender discrepancy in ICT use is rather small. Comparing Greek women use with those of the European average it has to be said Greek women lack behind.

The gender distribution in universities can be described as "men are overrepresented in polytechnics and sciences schools and women in the theoretical ones". Nevertheless the percentage of women undergraduate students grows almost every year and their presence in the "technological" schools remains amongst the highest in Europe. Regarding graduate

studies it is men that mainly pursue these, a differentiation that is enhanced at the PhD level. This holds even more for ICT related schools.

Explanations that have been provided in literature regarding the gender gap refer to the societal stereotypes and work conditions. Women are more attracted by professions that are offered by the State (as teachers) since such positions are considered to be "stable" and leave space for other obligations women have (i.e. children, family obligations).

7.3.4. Textbooks and resources

The introduction of ICT in schools as a new subject matter coincided with the raising of the discussion on gender issues among the educational community. This does not mean that gender issues are resolved or even really addressed in ICT. The early books used were characterised by a "technical" approach where not only the gender aspect but even the "human presence" was missing. These regarded computers as the machine and not on the person that would use or program the computer. This approach discouraged girls more than boys.

The current situation is described by two IT teachers that have analysed 10 school books of the secondary education and 4 books published by private publishing houses. "The analysis of the texts and pictures used in the books showed that gender stereotypes have not been omitted in the books' context. Women are presented as they are not using ICTs or they use them less than men do. The way women are presented in the books doesn't support the use of ICTs by the female side as this representation continues the old social inequalities." (Γεωργιάδου & Κέκκερης, 2009)

7.3.5. Interviews with teachers

Teachers seem to be well aware of gender differences. Issues relating to gender is addressed in many seminars teachers attend. However, noted is that while there is a rich discourse no guidance is provided in how to deal with the gender issue.

Teachers believe that the gender gap has two basic components. The first one has to do with societal stereotypes and the second with the curriculum of the IT courses that they characterize it as "male oriented". Girls are more hesitant to use new technologies and prefer to combine informatics with other subject matters (what teachers described as the "cooperative approach"). Teachers experience has shown that it is the orientation towards "programming" that increases gender differences while these seem to minimize when "applications" are used. Based on these observations their proposal is that a new curriculum is needed not only accounting for gender differences but also for enhancing the integration potential of ICT in other subject matters.

7.3.6. References

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[1] The Greek Schools Network (www.sch.gr) links all schools and provides basic and advances telematics services.

[2] The student's portal (http://students.sch.gr) aims to encourage students to use ICT providing access to educational content and electronic services. Another educational portal is www.e-yliko.sch.gr aiming to become a forum for teacher communication –it provides lessons plans, articles of pedagogical interest as well as links to educational sites.

7.4. Poland

7.4.1. Generalities about gender and education[1]

In accordance with the Polish Constitution and international law, the equality of women and men and policies against gender discrimination are a legal obligation. However, in the Polish education system, gender is still considered a marginal issue, although it is no longer consistent with the current legal situation. Two basic pieces of legislation (parliamentary acts): the Teachers' Charter and the Education System Act (they define the framework of the Polish school education system) do not seem to recognize equality between men and women, both are "gender blind" (the word "sex" does not occur in their content at all).[2]
Some trends depending on gender can be recognized in schools. A gender gap can be noted in the results of the national examinations. Boys systematically receive less points than girls in he humanistic part. The opposite situation takes place in the part of mathematics and natural sciences, in which boys receive slightly better marks (but differences are smaller here).

7.4.2. ICT educational policy in a nutshell

The reform of the Polish national education system started in the school year 1999/2000. One of the main features of it is the plan to integrate Information and Communication Technology (ICT) into almost all school subjects. The second important feature is preparing students to use computers and software in other subjects during separate ICT lessons. The separate lessons on using computers and ICT are called informatics. Informatics lessons are obligatory in primary schools and in middle schools (gimnazjum). In high schools (liceum) there is an obligatory subject called information technology (IT) and an elective subject called informatics (computer science). It is possible to take the maturity exam in informatics when someone has graduated from high school.[3]
In particular, it is noted that during the last 3 years in Poland the number of students on technical, mathematical and statistical and physicist courses was 3.2 % lower in comparison to 2007. The need to change these negative trends has been recognized. It is one of the reasons why the aim of the third priority of the country's development strategy 2007-2015 (employment growth and improving its quality) is an increased number of graduates in

mathematics, natural sciences and engineering from 15% to 25% in the period from 2005 to 2015.

7.4.3. Girls in STEM

A lack of data makes it impossible to verify the interest of women in science and technical fields. It is considered that financial factors have contributed to overcoming stereotypes associated with employment in IT sectors. In addition, many organizations promote women in IT sectors, including to managerial positions. Constant increases in remuneration in the IT sector causes the intensification of interest in the relevant directions (computer science is in seventh position as regards the most popular direction of study).

Universities have been observing a temporary decrease in the number of people who have been receiving academic degrees, including degrees in technology. The percentage of scientists employed in technical and science courses has also decreased.

Data showing differences in the use of computers between men and women are fairly consistent.

7.4.4. Textbooks and resources

The analysis of textbooks for entrepreneurship and mathematics reveals that these materials often provide gender stereotypical contents. Economic differences in income are considered to be natural and shown without embarrassment. Descriptive tasks in a mathematics textbook show women who do only basic grocery shopping, bake cakes and sew doilies. By contrast, men run businesses, repair services, do surveys, and if they buy something, then it is cars, technical articles, or computer units. Studies show that the reluctant attitude of girls in mathematics is reinforced by stereotypes, rather than actual results, identical to those achieved by boys determinative of lack of interest in the subject. Differences between men and women on the prestige scale, the authors of textbooks also consider also obvious. Men controlled the economy and had full access to resources of labor markets, while the women are shown as incompetent and do less important office functions. As far as manuals for computer science, many teachers don’t use them and preferring their own materials. The available textbooks are written in scientific style without gender stereotypes (formulas and print screens). Preliminary analyses of online materials for pupils indicate similar results.

7.4.5. Interviews with teachers

The results of research show that most girls currently gaining knowledge in the field of information technology in secondary schools on Polish territory are interested in issues of ICT, but up to 50% drop out of a career in science and ICT. It turned out that most disincentive factor is perception of the technical professions as "naturally more appropriate for men". In Poland, information technology is a favorite subject of young schoolgirls. The level of knowledge and skills represented by both sexes is similar. Schoolgirls do not decide, however, to continue learning information technology or start a career in this industry. Schoolgirls in Poland are strongly influenced by sex-based role models - 58% of students follow patterns, of which 70% is provided by other women (mostly mothers). This is really a problem, because almost 40% of mothers had never used a computer at work or at home, much less likely than men in the study group. In addition, mothers and teachers often see the Internet and industry as a "male world". Furthermore, it was also pointed out in several interviews that the ICT competencies of many teachers are far from sufficient to enable them to use the application of ICT during lessons, also in STEM and other subjects. This means that teachers often don't know how to apply ICT in the classroom. In Poland we can observe also a lack of textbooks that demonstrate the application of ICT during STEM and other subject lessons. Teachers must themselves prepare after hours useful resources.

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[1] http://www.educa.ch/dyn/67389.asp

[2] Raport krytyczny. Ślepa na płeć. Edukacja równościowa po polsku. Anna Dzierzgowska, Ewa Rutkowska, Fundacja Feminoteka, Warszawa 2008

[3] Informatics and ICT in the Polish education system, Ewa Gurbiel, Grazyna Hardt-Olejniczak, Ewa Kolczyk, Helena Krupicka, and Maciej M. Sysło

7.5. Slovakia

7.5.1. Generalities about gender and education

The school co-education of boys and girls exists since the establishment of the Slovak Republic in 1993. At the primary level there are no significant distinctions, but the secondary schools show some gender differences; girls have a strong predominance in the girl's vocational, educational, medical and commercial (business) schools, secondary schools for health-workers and professional schools for librarians.

At university level education, female students account for more than one half of the total number (54,92%). They study especially medical and pharmaceutical sciences, social sciences and sciences of arts. There are more male than female students at technical and military fields of study. Approximately the same number of men and women is engaged in natural sciences, agriculture, forestry and veterinary sciences.

With regard to the paradigm of a knowledge-based society in EU, it is important to motivate women to participate particularly in ICT and STEM areas in order to moderate the gender disparities. In context to demographical tendencies in Slovakia, the sooner such integration will be in operation; the better perspectives of human resources might be expected.

7.5.2. ICT curriculA in the Slovak Education

Unlike some of other school systems in EU, the ICT education is directly embedded in the Slovak school curricula on the primary and secondary educational levels. Informatics curricula differ according to the type of school. The mission of the subject Informatics at the gymnasium is to lead pupils to the comprehension of essential concepts, approaches and techniques used at work with data and by stream of information in computer systems (Microsoft Office, etc.). Specialization in Informatics at gymnasia (secondary schools) is realised by an extension of number of IT classes, curricula are connected with more algorithmic view and programming languages.

The development of ICT culture in Slovakia at primary and secondary schools is supported by the Project Infovek. It helps to train thousands of teachers in integrating modern ICT teaching and their application into the education process, it develops modern ICT curricula and equips schools with a multimedia classrooms with high speed Internet access. A segment of

secondary schools (gymnasia) started with ECDL certification (European Computer Driving Licence) of students before they finish school with A level examination from Informatics, which gives the necessary qualification to students for their further careers also outside of Slovakia.

7.5.3. Qualitative Research Findings

a) Textbooks

Five textbooks of Informatics used at secondary schools were analyzed from various angles (images, exercises, texts). Typical feature is related to neutral (in some cases almost asexual) illustrations and explanations of IT phenomena, while texts seem to be abstract and thus non-discriminatory. Female or male names are mentioned only marginally (textbook for work with tables). Texts are mainly in plural. In other case, the number of appearance to female gender in texts is generally 1:3 to the male gender (in some cases 1:5 and 1:8), so female aspect is underrepresented. There is a textbook without any female aspects in its contents.

b) Questionnaires for teachers and IT professionals

12 teachers (8 women and 4 men) were asked to fill in a questionnaire on their usage of IT and no special revelation emerged. Concerning their perception of the gender issue, the main remarks were that e.i. boys have generally better understanding for ICT (downloading, Powerpoint presentations) and they use their computer to play, meanwhile girls use computer mainly for practical reasons (find information related to classes) and chat. Our focus group assesses ICT mainly as a tool of better explanation, communication channel and visualization of subject matter. A preliminary inquiry addressing 11 IT professionals in Slovakia were performed in September 2009. Findings show no significant differences between 7 women and 4 men in their motivation to work in IT sector. Several pros and cons were quoted, such as flexible working hours, financial assessment and professional growth, young colleagues, good working atmosphere or opportunity to keep learning, in contrast to little space for creativity or gender wage gap.

7.5.4. References

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Project Infovek, 2009. <http://www.infovek.sk/>

7.6. Spain

7.6.1. Generalities about gender and education

The report shows the two faces of the situation of ICT and gender in Spain. At the same time, the rapid changes that the Spanish educational system is currently undertaking, bring as a consequence that both data gathering and analysis are not totally consolidated, and can be obsolete in a short time. However we can point out some aspects that are relevant to the work done in PREDIL.

Secondary education is sensible to gender equality in its main goals since it intends in this case to "appreciate and respect gender difference and equality of rights and opportunities; and reject stereotypes that can lead to discrimination between men and women". A policy of gender equality is embedded at all levels in subjects and in teacher education, however the practice many times does not go parallel to these policies.

7.6.2. ICT educational policy in a nutshell

ICT is considered as a learning tool more than a subject, to be used in all areas and subjects. The main focus is information literacy, digital literacy and a didactical resource. In this respect, teacher education in ICT follows the same approach. Teachers of compulsory education have an ICT compulsory subject in their careers, digital literacy related, although other optional subjects are also included in relation to the didactical use of ICT in the classroom. Also, there is a great variety of inservice teacher training in ICT provided by the regional educational authorities (some online), which hold special programmes in the field of ICT. At upper secondary education, there is no training in ICT other than that related to specific knowledge areas. The new Master's degrees which will be in place in 2010 will include didactical aspects of using ICT. The new initiative "School 2.0 for digitalizing upper primary education and secondary education (one child one computer) is on the stage and brings new teacher training needs in the field of ICT. If we talk about ICT facilities at schools, generally the support teacher is usually male.

7.6.3. Girls in STEM

However, the reality might be different, specially in looking at the number of students selecting the scientific-technical baccalaureate, which shows a low representation of women

in the technology option (only 22% of girls finished the technology baccalaureate, while 55% finished the Experimental Science & Health option in 2005).

At University level, there is a clear under-representation of women in STEM studies. At the same time, the situation in the STEM-related careers is worrying, as demonstrated by the fact that the number of students, both male and female, decreased 30% average during the last 5 years, and in some universities the decrease has been 50%.

Gender inequalities in respect to the access to services/information is also shown, however the access ratio for men and women is getting close. A similar situation can be depicted in education & training

In the ICT-related industry women are underrepresented, not arriving at 22% in the best case, aggravated by the fact that women's salary is lower than men's.

7.6.4. Textbooks and resources

The study had an exploratory nature. The objective was to quantify and critically analyse the existence of gender representations (pictures, etc) and stereotypes in the school books and other learning resources, including the electronic ones (web sites, software, etc). In the end only web-based resources were analysed. Materials were divided on resources for teachers and resources for students. Specifically, for teachers: the analysis of a portal on "education on values"; a portal dedicated to teaching resources, and a teacher training portal. For students, an online learning resource portal for the subject "technology" and another one for the optional subject "informatics", at secondary education level; and a portal containing students resources

Preliminary results indicate that in the teachers resources portals predominate male acting expressions (82%), and male pictures (in this case the ratio was 3:1), sexist expressions were 22%, whereas acting persons (male and female) were equivalent. Neutral expressions were the majority (78%). As with respect to students' online resources, male oriented pictures were 75%, men acting people were 90%, neutral expressions were 60%, and sexist expressions were 40%.

The results, just indicate that are gender stereotypes are still dominant in educational resources for the learning community, even in the new digital format. This issue should be

explored further, given the fact that the sample was small, including a larger sample in terms of subjects and types of resources.

7.6.5. Focus groups with teachers

The focus group gathered 17 teachers who were contacted as been interested in the PREDIL research focus, given the fact that they have participated in actions related to ICT and gender, or in related issues. Significant results are:

Students in general, and girls particularly, suffer the consequences of the curriculum organisation at the time of choosing certain subjects. Girls are forced to certain extent to not to choose technology-related subjects if they have decided to choose social science subjects.

STEM careers, very much connected to ICT are seen by the majority of girls as a male world, already at the upper secondary school and baccalaureate. In this sense, societal roles models are considered by the teachers as very influential in both girls and boys. The fact that most of the technology teachers are male, can reinforce this perception in girls.

Socio-economic factors, according to teachers' perceptions, are not important in students decisions when students come from a high economic level, and are more significant in boys and girls with parents with lower incomes.

Digital natives show fewer differences in terms of attitudes towards ICT: the younger students are the lees differences are found, since girls are digitally literate as boys are. Girls undertake ICT-related projects at the same level that boys. In fact both, integrated in the day-to-day social used of ICT, give little importance to the use of ICT in the classroom, since it is perceived as a natural thing.

However, an important aspect to take into account, is the fact girls many times reject the type of tasks proposed, since they perceive them more for techy boys; they prefer, according to teachers, tasks in which communication tools are more important.

As a conclusion of this workshop, we can see gender differences in dealing with ICT in the classroom are perceived by teachers, but these differences are caused by different factors. Certainly, lack of training and of awareness tools for mainstream teachers is a concern.

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7.7. Switzerland

7.7.1. Generalities about gender and education[1]

The responsibilities of the educational areas in Switzerland are subdivided between the Confederation, cantons and the municipalities. There is no ministry for education at national level, so that the main responsibility for education lies with the cantons.

Overall there is a principle of equality for women and men in the education system. Anyway, some trends related to gender can be identified in schools, especially in the scientific area where a noticeable predilection of male is evident.

7.7.2. Swiss ICT educational policy in a nutshell

The main thrust of educational reform in Switzerland currently concerns the question of harmonization. So far there is no national curriculum in Switzerland, as devising the curriculum is the legal responsibility of individual cantons. Presently ICT does not figure systematically in the curricula of the cantons and only a few cantons have a strategy for the inclusion of ICT in school teaching, and even fewer have ICT classes.

As far Canton Ticino is concerned, there are no specific measures for the integration of ICT in the compulsory school curriculum. In the next school year (2010/2011), courses in informatics will be introduced in high school. Teacher training programs to this purpose are currently being held.

In a PPP (Partnership Public-Private) study on ICT integration in education over 70% of those responsible for ICT in schools pointed to the lack of knowledge and know-how on the part of teachers as being a barrier to the achievement of objectives set for ICT use. As for the teachers, over half (57.1%) assessed their ICT competencies to be above average although women generally judged their competencies to be on average half a point less than men (on a scale from 1 to 5).

However, in the 2006 report of the SFIB (Schweizerische Fachstelle für Informations- und Kommunikationstechnologien im Bildungswesen) on teachers' professional development in ICT use stresses that considerable progress has been made since the last report was published in 2001. Teacher development in ICT use is now organized in optional, in-service training

courses although some courses have been made compulsory. Such training courses are organized by ICT competence centres located in each canton.

The existence of an ICT competence center in each canton indicates the intention to take care of a smooth and effective exploitation of digital media in school teaching. Understanding what the strategies are, and how they are implemented in school teaching would make the subject for an interesting research, as few data are currently available.

7.7.3. Girls in STEM

Studies have noticed that in Switzerland both men and women increased their use of internet in the period of observation (between 2000 and 2004), but that the percentage of women using internet is constantly inferior to that of men (77% against 62% in 2004) [2]. However, the distance between the two figures slightly decreases over time. When it comes to higher education, Switzerland seems aligned with international trends, that see a large gender gap in the selection of careers, where ICT and technical sciences see the lowest percentage of female students. Access to university shows a big deal between males and females with a distribution that shows a predominance of the former for the technical and economic branches and of the latter for social disciplines, Medicine and Pharmacy and Law. Indeed, Technical Sciences (among which are Informatics and Computer Sciences) have the lowest rate of female versus male ratio, while the percentage of male / female obtaining university degrees became nearly the same since 2006[3].

In the area of professions, the income for males is generally higher than the income for females. While income for men steadily increases with age, for women it strongly increases between the age group 20 to 29 and 30 to 39, while after 40 years old it appears to decrease.

7.7.4. Textbooks and resources

As ICT does not figure systematically in the curricula of the cantons, and particularly in Canton Ticino where there are not specific measure for integrating ICT in the compulsory school curriculum, no text books are available on the topic. Nevertheless, some support instructional materials (mainly online resources and a few publications) are available for teachers and pupils in the area of ICT.

The analysis of these resources reveals a quite gender-sensitive design, especially in the use of the images with a general balance between male and female presence, also in leading

positions. The analysis of expressions, both in the case of websites/online resources and of publications, generally reveals attention to the gender issues, even if there is a slight predominance of the use of male expressions, mainly due to the use of languages (both Italian and French language texts were analyzed), where the presence of male expressions for a group of persons is typical. In some cases, a gender sensitive approach is revealed by a large use of neutral expressions or both male and female expressions (with the female expression in first position) and sometimes even by the use of only female expressions.

7.7.5. Interviews with teachers

The focus groups gathered 8 available teachers, even if more teachers were informed about the project and will be involved in the next steps. First of all, it should be emphasized that, as ICT does not figure systematically in the curricula of the cantons, and particularly in Canton Ticino, teachers actually use only a few technologies in class and have a lot of difficulties in finding resources. In general, also students seem to lack in competences in the use of computers for learning and working (while they are generally skilled in using instant messaging applications, mobile phones and other personal devices).

The overall teachers' approach is to deal with students with no gender differentiation at all. The first perception emerged is that there are actually no differences related to gender. During the discussion in the focus groups, such conviction seems to falter: prompted to reflect on their experience, teachers started to acknowledge that differences between male and female exist and should be considered.

The most observable differences between male and female students is that girls use much more technologies related to communications (such as mobile phones, social networks applications, etc.) and pay more attention to the esthetic qualities and to the presentation of what they produce. On the other hand, boys seem to get much more engaged if there is a task where they have to analyze and solve a technological issue. This attitude is generally observable in other topics and tasks: girls generally want to be well prepared and organized if they have to perform a task, while boys tend to jump into tasks with less concern and preparation. This is in itself an attitude that can facilitate approaching ICTs.

Another general tendency that teachers observe and that, according to someone, could explain the gap in the choice of the career is that girls seem to be much more attracted by a kind of job

where they can establish relationship with other people, and are consequently less interested in “dealing with a machine”.

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[1] http://www.educa.ch/dyn/67389.asp
[2]http://www.bfs.admin.ch/bfs/portal/it/index/themen/00/02/sektoriel/03_05/03_05_02/03_05_02_01.parsys.0004.Image.direct.gif.html
[3] http://www.bfs.admin.ch/bfs/portal/fr/index/themen/15/06/key/ind1.indicator.10401.html

7.8. United Kingdom

7.8.1. UK Generalities about gender and education

In the UK, students aged 16 years take a series of subject-specific examinations (GCSE) at the end of compulsory schooling. Girls have consistently outperformed boys in almost every subject over the last few years. Another characteristic difference is that girls tend to achieve passes in a wider range of GCSE subjects, than boys do.

Whilst a greater number of those going into post-compulsory education (A-Levels) are girls, boys outnumber girls in the STEM subjects, except in the study of Biology. The superior performance by girls in examinations continues at A-Level, even in the STEM subjects, yet at each stage of educational decsion making, there is a dramatic attrition in the percentage of girls choosing to study STEM subjects further. At University level, the ratio of boys to girls, across all subjects, is similar to that at A-Level. However, when taken in the context of the superior performance of girls at A-Level, there may be an underlying story of boys and girls with the same grades having different attitudes as to their suitability for futher study.

7.8.2. ICT educational policy in a nutshell

ICT is a compulsory subject in the curriculum at all stages of study, from the ages of 5-16 years. Assessment (usually GCSE, but occasionally other qualifications) is optional. Those students who choose not to take such assessments tend to follow a lighter course covering more basic elements of the ICT curriculum.

There has been a recent change in the ICT curriculum for secondary schools. This has been updated to reflect the change in the ICT environment where e-safety and collaborative working are emerging issues. The four key strands in the secondary ICT curriculum are; Finding Information, Developing Ideas, Communicating Information and Evaluating. These strands are reinforced across the curriculum. Emphasis has moved away from the use of ICT in control processes, towards more functional ICT skills. This move towards functional skills is part of an overall shift in policy within the secondary curriculum. The cross-curricular application of ICT is also being emphasised. ICT is used as a vehicle for problem solving, data handling and manipulation, social, legal and moral education as well as in supporting independent learning.

Whilst ICT is a statutory subject with a programme of study and associated learning goals, schools are free to decide how this programme is delivered. The Ministry of Education (the DCSF) provide support in the form of documentation for delivery of the ICT programmes, both as a specific and as a cross-curricular subject.

There is a government agency (BECTA) whose sole brief is to promote the effective use of ICT in schools. This includes taking a leading role in 'harnessing technology' to ensure the effective and innovative use of technology within teaching and learning. It is also expected to encourage a greater use of technolgy by a wide group of stake holders in education and children's services. There are also other non-profit organisations (e.g. Futurelab) whose remit is to develop innovative technolgies and practice in ICT for teaching and learning.

7.8.3. Girls in STEM

A recent report, *Women in IT Scorecard*, produced by the Department for Business Enterprise and Regulatory Reform (BERR) present data on the position of females in IT professions and education in the UK. Parts of this section are informed by some of the details in that report.

The difference between the choices of careers and course of study by boys and girls is apparent at A-Levels, immediately after compulsory education. Across STEM subjects, only in Biology do girls outnumber boys (58%). The apparent gender equity in Chemistry (49% Female), must be considered against the backdrop of the higher participation rate of girls in A-Levels overall (54%). The differences in Maths and ICT are not so severe with about 40% female participation. However, in Physics the discrepancy is more apparent (22%) and the greatest imbalance occurs in A-Level Computing, where only about 10% of participants are female.

Across STEM subjects, Girls account for under 30% of the population. Over half the girls involved in STEM subjects at degree level are involved in Biological Sciences. This produces much greater disparities than might have been expected in all other STEM Subjects. The most extreme example being in Engineering courses, where only 12% of undergraduate students are female.

Despite the superior performance by girls at every educational stage in the STEM subjects, the number of females entering STEM professions is very low, even as a proportion of those

graduating. Whilst females make up 45% of the workforce across all sectors, in ICT they account for only 19% and in Engineering they make up only 7% of the workforce.

The two most popular 'Computer' based courses available at A-Level are ICT and Computing. There is a significant difference between the content of the two courses. The ICT course is predominantly concerned with functional use of ICT. Whilst the course content extends beyond the scope of just facility with standard computing software, its focus is on how ICT can be used in society, and the implications of that use. The Computing course places greater emphasis on computational thinking, with emphasis on abstraction, problem solving, algorithmic and scientific thinking. This course focuses, less on the computer, but rather more on the nature of computing and its widest applications. In the UK, there is some degree of parity between girls and boys choosing to do A-Level ICT. However, on A-level Computing courses the ratio of boys to girls about 9 to 1.

The content of ICT and Computing courses equip pupils with very different skills and thus affect possible career opportunities. The skills developed in ICT courses point at end-user type jobs or careers. In these contexts technology is generally used as an administrative tool. The Computing route points more directly at the use of technology as method of information and workflow management. The high ratio of boys to girls employed in the technology field is apparent in all aspects of the industry, with the exception of the most poorly paid sector of Database Assistants and Clerical staff (BERR 2008). This disparity in ICT roles in the workforce must account for at least some of the inequities in pay across the ICT sector, in which men earn on average 13% more than women. In the UK at least, addressing inequities in ICT take up might well be missing the point of gender equality in the Technology field.

7.8.4. Main qualitative research findings

Interviews were carried out with 4 teachers, a curriculum consultant, the Head of Department of Computer Science at Sunderland University, 2 female Computer Science lecturers at Durham University and the Deputy Head of a post-compulsory education college. Opinions and ideas were elicited from various members of a National ICT research network with an interest in education.

Boys and girls were seen to achieve equally well on ICT courses, though each tended to have their favoured areas of excellence. It may be that the course material sampled from a range of

domains allowed girls and boys to demonstrate their own strengths. The general feeling was that tasks were not gender specific.

7.8.5. Differences between Boys and Girls

Teachers' comments about the differences between boys and girls highlighted the different focus which boys and girls have with regard to ICT. In general it was felt that girls tended to engage with the surface characteristics of the task. Girls' interest centred on the context and 'whole task' issues and they tended to switch off if the context was not interesting. It was reported that boys tended to focus on the technical aspects of tasks. Context was generally irrelevant. Girls saw tasks as being multi-faceted and their approach to achieving well in the tasks involved demonstrating high levels of competency across aspects of the task. As such, their work and mark profiles tended to be well spread across all learning objectives. Boys were characterised as seeing tasks as opportunities to demonstrate their excellence in specific areas. Boys generally preferred target oriented tasks and tend to see these in terms of the ICT type jobs to which they may lead, Games Programmer being seen as the ideal job. Girls tend to do better at and prefer the organisational aspect of ICT tasks, whilst boys tend to focus on the parts of the task which they feel are important or necessary (not always the same thing) whereas girls just want to do well in general. For boys context was broadly irrelevant. Boys and girls were both were both thought to demonstrate creativity. However, girls' creativity was identified as being more conventional, whilst boys' creativity tended to be in the technical domain.

An interesting observation was that whilst it would appear that girls and boys were doing the same task on the surface, each perceives the task differently. Boys sometimes focus on one specific aspect of the task, to the exclusion of all else, often to the detriment of their overall grade.

This difference in inclination and aptitude to ICT was not seen as problematic. The analogy was drawn with boys' books and girls' books, where differences are seen as quite normal and unproblematic.

8. Annex 4: Prototype for an on-line questionnaire

11/24/09

Male/Female School / College: Year Group:

We want to know how you think and feel about technology, and the ways you learn about it in school.

Experiences about ICT

a) Your experiences in school

	Never	Sometimes	Often	Would like to learn
Word processing				
Spreadsheets				
Databases				
Presentations				
Download Data				
Programming				
Play Games				
Graphic Arts				
Surf the Internet				
Chat				
Forums				
Blogging				
E-Mail				
Educational Software				
Research for School				

b) Your experiences at home

	Never	Sometimes	Often
Word processing			
Spreadsheets			
Databases			
Presentations			
Download Data			
Programming			
Play Games			
Graphic Arts			
Surf the Internet			
Chat			
Forums			
Blogging			
E-Mail			
Educational Software			
Research for School			

At School do you use computers in the following subjects

	Never	Sometimes	Often	Not Studied
Information Technology				
Language				
Maths				
Foreign Languages				
Biology				
Chemistry				
Physics				
History				
Politics				
Economics				

Geography				
Ethics				
Religious Education				
Arts				
Projects				
Other (Please State)				

Opinions about ICT in school

'Technology' means all the things you said 'yes' to in the 'Your experiences at school' section.

1: 3 things that make it easier for me to learn about technology are…	1) 2) 3)
2: 3 things that make it harder for me to learn about technology are…	1) 2) 3)
3: People who are successful in my technology classes are…	1) 2) 3)
4: People who are unsuccessful in my technology classes are…	1) 2) 3)

Opinions about ICT related careers

Complete the following sentences…

7: 3 things that would be good about doing a degree in technology are…	1) 2) 3)
8: 3 things that would be bad about doing a degree in technology are…	1) 2) 3)
6: 3 things that would be good about a career in technology are…	1) 2) 3)
6: 3 things that would be bad about a career in technology are…	1) 2) 3)