

MIND THE GAP



ERASMUS + PROJECT

Need Analysis Spain



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PART I – DESK RESEARCH

The situation of women in technological fields in Spain

In the current Spanish framework, the representation of women in technological and innovation fields continues having the influence of gender stereotypes, and even here we can talk about more subtle stereotypes than past years, when the inequality was too evident and there was a social interest to reduce it. Now, it seems that everything is well done, but inequality still exists under thin shapes and difficult to face.

From the perspective from other projects carried out in WiTEC, one of the areas that definitely makes a difference is school and later, the academic studies. In both areas shapes the identity of people, their preferences and also their expectations and career path

Concerning the degrees, Spain shows similar proportions to the European Union related to enrolled women in higher education: (overwhelming) 74% in Health Science, 62% Humanities (majority but slightly lower) and 58% Social Sciences.

The presence of women in Science fields (35%) and mostly in Engineering (30%) is still minority. Having said that the minority of this presence, the progress of the proportion of female enrolled students in Engineering has been higher in Spain (30%) than in UE-15 (25%).

The proportion of PhD women in Spain lead also UE-15 in all knowledge areas. The temporary evolution during the period analysed here is favourable to women's presence, especially in specialization areas which their influence is minority (for instance, in Engineering and Technological fields we can see an increase from 4% to 30% of women's presence in recent PhDs).

It is exactly at knowledge areas of Natural Sciences, Engineering and Agriculture Sciences, the proportion of PhDs is higher than UE-15, despite the lower proportion of women's presence.

Along the decade, there have been a fall in the ceiling-glass index of the Spanish public University. That means that despite the difficulties that women find in their professional promotion in the University, the situation is slightly positive and optimistic towards the future because of generational effect. Nevertheless, the index is situated in 2,34% over EU's average (1,8 en2007) and important differences exist according to some knowledge areas (numbers go from 2 in Humanities to 3,06 in Medical Sciences).¹

The number of technological vocations drop all over the world, especially in the female sector. This last decade, people enrolled to these degrees have decreased 30% as a MIT². In Catalonia, the situation is worse. An 'Every's' document from the Education Department points that engineering have lost 46% of students, including the percentage of women that is held back and in some grades it reduces little by little. They (women) are 54% of the total of University students, have better grades and finish their studies before men; but in technology degrees they stay at 26%. The academic year of 2004-2005 they represented 27,1% in the branch of engineering. In the world, 80% of engineers are men.

¹ *Unidad mujeres y ciencia Ministerio de ciencia e innovación. Científicas en cifras 2010.*

² *Massachusetts Institute of Technology*

It has not always been like this. The time here has not been gender equality's favour. The UPC³'s dean, Núria Castell, remembers the decade of 1980 when women reached 40% of computing students. Back then it was 'Bachelor's degree in Computing'. But in 1991 the name changed to 'Computing Engineering'. *"In just few years, women went from being 40% of students to 18%"*. Castell studied this phenomenon and the conclusion was clear: *"the new name chased the girls away"*. Now, this faculty of UPC has only 6% of women among the students of first year, what makes this degree to be the lowest percentage in all the University. The word "engineering" loads some stereotypes: difficult studies, a job for men... in addition to computing engineering, a *geek* degree. This is the vision of most of the students of secondary school and A levels, as it is shown in the document "The world needs femal engineers, do you want to be one?", leaded by the researcher and technological activist María Villarroya from University of Zaragoza, that have interviewed many secondary school's students.

Girls are better in reading but worse at maths. Spanish students, in general terms, have always shown this skills and incompetence, even the differences between their male classmates are more widen year after year. In spite of their good grades, among other matters, as girls work more and they are more constant (they invest 1 more hour to do homework than boys do). They (girls) are ambitious but few of them dare (even now) to think about a future linked to science and technology. They see themselves more as doctors or teachers. Boys are perfectly well confident about themselves, this is well appreciated, for example, when facing a maths problem: 47% of female students recognise to get very nervous to face problems, opposite to 36% male students.

In 2012 only 14% of female young opposite 39% male young chose a science, technology or engineering degree at University or vocational courses. This also has its consequences in their work career: these studies have more career opportunities and usually with better salaries.

Stefan Kapferer from OCDE⁴ insisted that the explanation about educational gap should be found in young people's influence *"from families, teachers, classmates or TV"*. *"Solving these differences is not only a public objective but a moral need. We are in societies that are getting old and we need to take advantage of all talent available"*, says OCDE spokesperson.

A recent study managed by social psychology Mercedes López Sáez from University of National Distance Education, and funded by Ministry of Labour and Social Affairs, analyses the influence of psychosocial factors in the unbalance of interest of girls in technical studies.

In A levels, the majority of girls (55%) choose Humanities and Social Sciences; other 36% prefer Nature & Health Sciences; 5% are enrolled in Arts. Only 4% choose Technology. The report from López Sáez and her colleagues, analyses how teachers and students attitude affect to these choices, the stereotyped beliefs about different modalities in A level courses, the implied attitudes of men and women that study medicine or engineering, and the relationship that every sex have towards the computer and computing.

³ UPC = Polytechnic University of Catalonia

⁴ OCDE (Spain) = OECD - International organization helping governments tackle the economic

According to a survey among teachers, *“they tend to devalue A level modalities that that include linguistics (Humanities and Social Sciences), as far as intellectual abilities that are required as professional possibilities that they open”*. The gender unbalance is explained *“because of differences in attitudes and motivations of the socialization, just as boys feel persuaded to some areas, while girls are more inclined to others”*.

Prejudices still seem more settle among the students, which *“they persist strong gender stereotypes linked to every speciality”*. While Humanities and Social Science are equal seen as male and female branch, they always understand Technology as a male branch. *“Definitely”*, resolve the authors, *“the choice of a technological A level for girls is not reinforce in the social environment of parents”*.

The teenagers stereotypes (4th year E.S.O.) also do not offer a very bright picture: *“Teenagers believe that the most feminine girl belongs to Natural Sciences and Health, followed by Humanities and Social Sciences, considering the girl in Technology being less feminine”*. Inversely, *“the attribution of masculinity in boys, the highest score awards the Technology boy, followed by Humanities and Social Sciences and Natural Sciences and Health”*.

The test to detect implicit associations that establish teenagers provides the following result: *“Implicit attitudes toward female doctors are more positive than toward female engineers; implicit attitudes toward male engineers are more positive than to male doctors; the attitudes toward female doctors are more positive than to male doctors; and attitudes towards male engineers are more positive than women engineers”*.

López Sáez and her colleagues have found a deficit in girls' attitudes towards computing and computers: *“They have more negative stereotypical beliefs that boys as to the characteristics of the profession, they use computer less and they are considered less competent than boys in computing and in the use of computers ”*.

Stereotypes linked to the professional choice

The representation of women in the fields of technology and innovation continues to be influenced by prevailing gender stereotypes. Stereotypes are subtler now than in the past when inequality was very evident and there was a social interest to reduce it. Now, it seems that everything is in order, but **inequality still exists below the surface** and is difficult to uncover. So the barriers have remained and are hidden behind the idea that Spain has reached equality between women and men, especially in the fields of education and employment.

Although there have been a clear progress in recent years in this direction, statistics show that in many careers and studies traditionally held by women or men, now are trends are more balanced, so the occupation tends to be by both sexes; however, there are still areas that are still dominated by a majority of girls or boys. For example, studies related to personal image, health, social care or education, are still held by women, while electricity, mechanics and IT (telecommunications) are primarily a boys' choice.

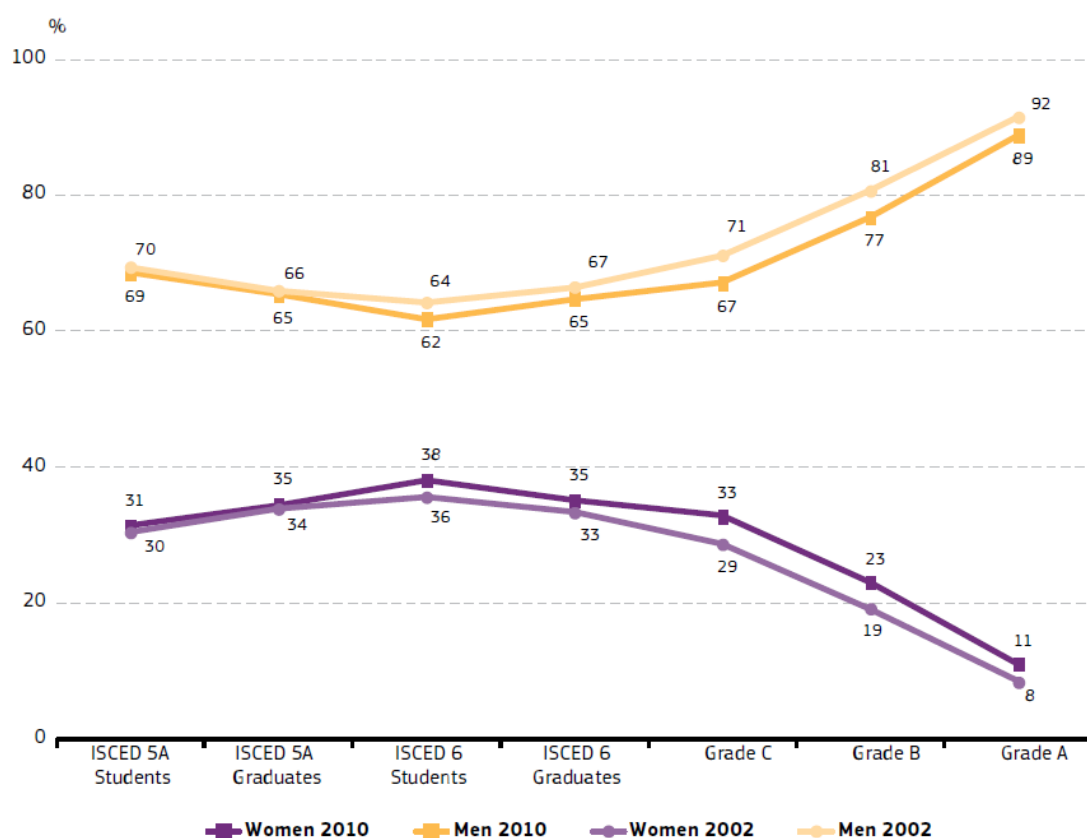
The Expert Working Group of Women and Science published the ETAN report in which the European policies were analysed (Mischau, 2001). It concluded that female gender equality in

education is **more than ensuring women’s presence in the classrooms**: it is also important which subjects they choose and how they develop their knowledge.

Like in the rest of the European Union, **women are in the minority in scientific jobs** in Spain, reaching only 37.5% of the research staff in public universities (in 2009). On average women represented 37.5% of the researchers in higher education and 43.6% in the public sector.

In the past decade, the glass-ceiling index of the Spanish public universities has decreased. Despite the difficulties that women experience in their professional careers at universities, the situation is **slightly positive** and optimistic towards the future looking at the next generation. Nevertheless, the index is situated at 2.3% over the EU’s average (1.8 in 2007) and important differences exist between knowledge areas; for instance the index is 2.0 for the area of Humanities and 3.06 for Medical Sciences.⁵

Figure 1: Proportions of men and women students in a typical academic career in science and engineering, 2002-2010.



Source: *She Figures 2012*

Despite girls gains in education, science and engineering remain a male field. As shown in Figure 1, women are only 31% of student population at the first level. The proportion of

⁵ *Unidad mujeres y ciencia Ministerio de ciencia e innovación. Científicas en cifras 2010.*

women increases the first echelons to reach 38% at the level of PhD students and 35% at the level of PhD graduates. It is clear in this figure the lack of appeal of science and engineering studies for young women is problematic at the earliest stage of a typical academic career in this field, as women tend to be better represented among PhD students and graduates.

The absence of a mixed gender composition in the different fields of study can already be observed in secondary education and is in turn reflected in higher education.

Barriers for women to aspire to careers in STEM⁶

- **Cultural and social stereotypes:** it is evident that women and men have the same cognitive abilities to develop in equal conditions in scientific and technological fields, but in many cases the roles assigned to each sex resolve the decision about preferences in all fields of social relationships.
- **Education:** we have presented examples and different studies in which school and training by teachers impose a determined social model that influences girls' and boys' decisions about their academic and professional future. It is very important to realize that our own educational system may well be a barrier that perpetuates stereotypes for boys and girls.
- **Role models:** teachers, media and family are role models that have great influence on the decisions for the future of young people. The lack of women on boards and in the upper echelons in STE companies is one of the main causes that young women have no role models when they reflect on their decision to choose science and technology fields.
- Especially in technological fields, there are some aspects of the technological knowledge that do not seem to be **interesting** to young students, especially young women. Technology is unfriendly in some aspects that are reflected in technical aspects that are linked with people care or people relationships. In the UK chapter we reported on WiTEC Association's recent project to develop an education plan for teachers to promote technological studies to young students (girls). One of the findings of this project is that **technology is not so attractive to young women**. Another highlight is that "fear" and "insecurity" exists when we talk about Maths; it seems to be the main obstacle for most of the students to not choose science and technology studies. In addition we have found data regarding Spain that confirms the lack of security related to Maths studies when we talk about female students. Finally, the PISA report confirms this again for Spain.
- If there are few women that study science and especially technology, it is expected that **very few women will be in these job fields**. The data in this Guide show that there are very few women in industrial areas related to science and technology, especially in the private sector.

⁶ 'Research Guide – Women in STE' 2015, "She decides, you succeed" Project

- It is important to emphasize that finding data and statistics about the situation of women in innovative sectors in private companies is very difficult. One of the most important conclusions therefore is that there is a **need to address the lack of data in the private sector about the presence of women in technological and innovative companies.**

In Spain, as in the rest of the European countries, legislative actions are being carried out that include equality quotas in workplaces. These measures should also **be extended** to women in decision-making positions in the academic fields.

PART II – FOCUS GROUPS

TEACHERS

Description of the target group

The session was attended by a group of 6 teachers from different schools in the town of Cornellà. All the teachers specialise in science subjects, except one, a trained architect, who teaches technology the IES Bellvitge school. The other teachers are graduates in Mathematics, Biology (3), and Physics.

Conclusions

- **The objectives of the FG were achieved**, that is, to hold a meeting with teachers from different schools to discuss the gender gap in STEM education. The meeting also enabled us to begin disseminating the, we were able to perform the first action of diffusion Mind the Gap project for the first time.
- **Project dissemination was achieved**, firstly, by contacting the management teams at the schools, informing them about the project, its objectives and the preparation of the training course. Moreover, we were able to involve 6 secondary schoolteachers in organising the FG, at which we were also able to disseminate and promote the project.
- **Concepts concerning gender in education were introduced**, and these concepts were shown to be related to the question of secondary pupils choosing science and technology degrees, particularly female students.
- **Thanks to the discussion and thoughts** generated by this lively group, we can present the following **conclusions**:
- Generally speaking, on entering the 14-18 year stage in life, female pupils show themselves to be insecure, and this is reflected, above all, in mathematics.
- Female pupils are good, hard-working students. There should not be differences when it comes to choosing science and technology degree courses.
- When female pupils choose science courses, these are generally related to care for people (health sector or biology).
- Models are very important. There are very few models related to technology in schools. There are no technology teachers, whether male or female, and no social or employment models that can serve as examples.
- Families tend to be a major barrier with regard to daughters choosing careers in technology.
- The media do not promote science and technology models that might be attractive to young women.
- Careers guidance processes still fail to promote STEM studies amongst young people in general, and even less amongst women.

- Technology does not present a friendly face that might attract women. There also exists a crisis amongst boys as regards choosing technology-related careers.
- There are no female models in the education system as a whole, not just in science and technology, but also in all other areas of knowledge and art.
- The situation in vocational training is even more serious as regards the gender gap. Women are very much the minority in training in such subjects as carpentry, mechanics, electricity, etc
- The teaching team needs to work together to address the problem. It is not enough for a group of teachers, whether male or female, to be interested in the issue. Rather, the task should be undertaken as an education project at the school.
- Co-education is a transversal subject in schools, and should not be implemented from an individual perspective or by a small group of teachers.
- Co-education is not a subject exclusively the concern of female teachers. Male teachers should also be involved.
- Specific training in these issues would be very useful.

GIRLS

Description of the target group

The session was attended by a group of 7 female pupils from different schools in the town of Cornellà in Barcelona. All the pupils are taking technological and scientific baccalaureate courses. In the Spanish education system, baccalaureate courses are differentiated by subject matter: science/technology, social/humanities and art.

Conclusions

- The objectives of the FG were achieved, that is, to hold a meeting with pupils from different schools to discuss the gender gap in STEM education.
- Through to the discussion and thoughts generated by this lively group, we reached the following conclusions:
- Like the teachers at their FG, the pupils confirm that there is insecurity, particularly when it comes to mathematics. This insecurity is the cause of female pupils' lack of interest in technology and science.
- The pupils are good, hard-working students, and note that they also do well in other subject areas, such as languages and the humanities.
- Their interest in science and technology is linked to such fields as health, business, and biology. None of the group mentioned any interest in working in clearly technical fields.
- Models are very important. The pupils reveal that their teachers were key in deciding their interest or lack of interest in different subjects. Family models were also important.

- None of the pupils reported any difficulties in their families with regard to the subjects they decided to study.
- The pupils have received no specific guidance as to what they can do with their science and technology studies.
- Technology does not present a friendly face that might attract women. There also exists a crisis amongst boys as regards choosing technology-related careers
- The pupils realise that there are no female models in the education system as a whole, not just in science and technology, but also in all other areas of knowledge and art.

None of the pupils can see themselves taking technological vocational training – electricity, information technology, mechanics....

PART III – ONLINE SURVEYS

Surveys were translated into Catalan and online distributed among teachers and students. Some of them participated in the Focus Group sessions and the rest were introduced during some sessions that Margarita Artal gave personally to some groups of students in the Centre of *Barcelona Activa* in Barcelona.

Teachers

The answers came from both women and men. These are some of the remarkable comments:

- More than 50% of the teachers think that the lack of interest is the main reason why girls do not choose STEM subjects for their future, apart from gender stereotypes and advertisement and media in general.
- Some actions that could help to drive out differences between girls and boys are the use of language and co-educational actions.
- Some suggestions from the teachers to encourage girls to choose STEM subjects:
 - Let them know that they have those options too.
 - To give them more information about these languages.
 - There are more real role-models to be visibilise.
 - Attend conferences.
- 70% of teachers would like to have more information to give their students to promote girls in STEM and to develop tools to encourage them.
- It is a highlight that the majority of teachers say that they see differences between girls and boys but they do not apply measures easily in their classrooms.
- Teachers are not aware of co-educative measures in the classroom and most of the time they do not have tools to improve this situation.

Students

The answers came from both girls and boys. These are some of the remarkable comments:

- Among all 47 students answers, only 17% like more Scientific studies opposite to 48,9% like Humanities subjects.
Most of them are not into Science and Technology. They rather study Social studies instead.
- It is remarkable that 3 of the most important reasons for not studying scientific and technological studies are: because they don't like the subjects, maths are an obstacle and they do not identify themselves doing these studies.
- The students that have chosen scientific/technological studies is because they see professional future and because of their family's approval.



- Half of the students do not have a person in their families that can relate to STEM studies or careers
- Even in English language cannot be appreciated, most of the students have answered about scientific and technological jobs in male gender, what shows the image of certain job positions in the market.