

GENDER MAINSTREAMING IN TEACHING: ANALYSIS OF STEM STUDENTS' PERCEPTION

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Abstract

The Universitat Politècnica de Catalunya, UPC-BarcelonaTech (UPC) developed in 2018-2019 a pilot project named Gender Dimension in Teaching, where a cooperative approach was adopted to reach gender mainstreaming in all Bachelor and Master degrees at UPC. During this project, gender issues were identified according to the experienced perception of the project participants. However, since teachers' perception might be influenced by stereotypes and prejudices, uncertainties aroused concerning its reliability. In order to overcome this issue, a students' survey design, test and improvement process was carried out. The present study analyses the results of the first version of such survey.

The survey was filled by 548 people from 3 Bachelor and 4 Master STEM degrees. The percentage of women was 30%, significantly higher than 20,70%, what corresponds to the women's proportion in the 7 studied degrees. This is not surprising, given the different degree of awareness related to gender issues, where women capture more biases than men.

Different aspects such as teacher's gendered attitudes, treatment received from classmates, students' participation and male and female referents have been analysed. The study has allowed to describe students' perception regarding gender equality in UPC degrees and to identify needs and weaknesses.

Results indicate that the bulk of the students consider that the UPC learning context does not account for gender biases, neither in the teacher-student interaction nor among classmates. However, referents, and especially female referents, is the major weakness. Also, the equity score given to UPC by female students is always lower than the score given by male students. The bigger discrepancy among both sexes lays in the treatment received by classmates. Also, classroom participation scores present significant discrepancies between male and female students.

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Keywords: Gender mainstreaming, higher education, STEM, student's perceptions.

1 INTRODUCTION

The Universitat Politècnica de Catalunya (UPC) is a public institution of research and higher education in the fields of engineering, architecture, sciences and technology. During the academic year 2019/2020 the percentage of female students was 27.9% [1]. Besides being low, the increase in the last thirty years has been dramatically slow.

Aware of the need of increasing the number of female students UPC began to implement action plans more than twenty-five years ago and, in 2007, designed its first Gender Equality Plan (GEP) with the objective of becoming a more gender balanced institution and where women had the same opportunities as men for their academic career. Now, in 2020, the 3rd GEP is about to end and UPC is preparing the 4th one.

In the framework of the 3rd GEP the UPC became a partner of the H2020 European project Gender Equality in Engineering through Communication and Commitment (GEECCO, SwafS-03-2016-2017), which has the main objective of implementing GEP at technical universities and has three main pillars: (1) Decision making (achieve gender balance in decision making bodies and include gender dimension in decision making); (2) Academic career (increase the number of women at all levels of university and remove the barriers that prevent women from keeping in the academic career and reaching the higher categories); and (3) Gender dimension in R+D+I and in teaching.

Once the GEECCO team at UPC had started its work on including the gender dimension in teaching, the Catalan University Quality Assurance Agency (AQU Catalunya), complying with the Catalan law 17/2015, which establishes that gender dimension has to be included in all Bachelor and Master degrees, published the “Marc general per a la incorporació de la perspectiva de gènere en la docència universitària” (General framework for the inclusion of gender dimension in university teaching [2]). According to this framework, all Catalan universities will have to show, from the academic year 2021/2022, that they have included gender dimension in teaching.

At the end of 2018 the GEECCO team, together with the Education Science Institute and the Gender Equality Unit from UPC, designed a pilot project for including gender dimension in teaching. This pilot project was developed during the second semester of the academic year 2018/2019 (i.e., January-July 2019). The main objectives of this pilot project, called Gender Dimension in Teaching, were to train a group of teachers (so they could also spread the voice to other colleagues) and to develop tools that could help UPC academic staff to include gender dimension in teaching.

A group of 35 lecturers worked during one semester focusing on the four pillars of teaching (i.e. contents, classroom management, methodology and assessment), which were revised from a gender perspective. Within each pillar, gender issues were identified according to the experienced perception of the project participants. However, uncertainties aroused concerning the reliability of such a perception. Indeed, teachers’ perception might be influenced by stereotypes and prejudices that could alter the identification of gender issues. Hence, it became obvious that more reliable data concerning students’ perceptions was needed. In order to assess this issue, a survey design, test and improvement process was carried out.

Hence, one of the tools that was developed in the Gender Dimension in Teaching pilot project was a survey to assess students’ perceptions regarding gender in teaching. The two main objectives of using this survey were: (1) to gather information from students to understand their perception, needs and weaknesses (implicit bias); and, based on the results of the survey, (2) to define the required gender actions in teaching. A secondary objective has to be also considered, and is to use the results (statistics) or the survey to increase awareness within the UPC academic staff regarding gender issues, following the advice of the handbook of the Female Empowerment in Science and Technology Academia project [3] advises.

There exist different surveys for evaluating teaching and for gender issues but, to the best of our knowledge, there are no surveys aiming at analysing the students’ perceptions in regard to gender issues in teaching, such as teacher’s gendered attitudes, use of stereotyped language or images, gendered roles in team working and male and female reference authors.

Available surveys were used for inspiration, even if none of them were specific on gender in teaching and hence did not fulfil the objectives of the team [4][5]. More information on the design of the survey can be found in [6].

The rest of the paper is organized as follows: section 2 explains the methodology for gathering and analysing the data; section 3 describes and analyses the results of the survey; and, finally, section 4 contains the main conclusions.

2 METHODOLOGY

The survey design was one of the key steps in the project, as it was the key tool for collecting and measuring students’ real and current perceptions. Online forms were used, which were made available to the students of each group through the digital campus.

It was important to capture students’ real perception, detaching it from prejudices or theoretical cases. Thus, most of questions were explicitly referred to the UPC, the university where the study was carried out. It was obvious that the study sought to gather information about that university itself, but that was not the only reason. It was a question of students not responding according to theoretical clichés of what they think or extrapolate from a generic university context. It was necessary to contextualize it, so that it necessarily referred to one’s own experience. In addition, given the nature of the university itself, due to the degrees taught there, the link to STEM was assured.

The questionnaire consists of 30 questions organized into three main parts. Within the personal Information section, the student is asked to provide some data relevant for our study as sex (three options: male, female, others) and age (within a range). As a specific goal, first of all, the need to ask for professional references was raised. People instinctively tend to imitate and mimic, not only behaviors, but also interests, from what can be considered socially (and historically) accepted reference models. This resulted in the Professional references part (questions 7-10). Second, it was important to consider

the student's personal perception in the teacher interaction with faculty, peers, considering participation in and out of the classroom (questions 11-27). That section was a very interesting source of information and an extra effort was needed to keep the survey to a reasonable size. This was achieved by grouping questions in a multiple selection grid, according to a common setting and a common Likert scale. The final questions referred to the difficulties, and the need for projects such as the one being carried out.

The survey can be found at [7]. An analysis of the design of the survey was developed [6].

Statistical tools have been used for the analysis: filtering data, grouping items within groups and analyzing each group first separately, then looking for some correlations and, finally, discussion of the global situation (equity culture perceived by students).

The pilot project Gender in teaching, in the framework of which the survey was defined, covered 16 different courses belonging to 7 different Bachelor (BA) and Master (MSc) degrees. The participants of the pilot project asked their students to answer the survey during teaching hours, which led to a high rate of answers. The questionnaire was filled by 548 people, which means 55% of the registered students. The rate of response among female students was higher than the one among male students (30% of the responses come from female students whilst only 20.7% of registered students at the BA and MSc covered by the pilot project at that time were female). This is not surprising, given the different degree of awareness related to gender issues, where women capture more biases than men. The percentage of students that do not classify themselves as male nor female is 1%.

Regarding the level of studies and age, 56% of the sample belonged to BA students and the 44% to MSc students. Finally, 93.79% of the students in the sample were below 26 years old.

3 RESULTS

The questions from the survey can be grouped in two main aspects: (1) students' perception and (2) male and female referents. The former includes potential gender biases from the teaching staff and from their classmates, together with their preferences when presenting their inquiries to their teachers. The latter includes the existence and names of male and female referents

3.1 Student's perception

In all the analyzed questions, female students are more aware of gender biases than male students. Indeed, despite the response of men students are more homogeneous tending to minimize biases, female students' answers are dispersed, with one main group that coincides with the bulk male answers and another one that reflects the perception of the existence of more biases. For instance, the 67% of male students considers that women are not struggling with their UPC studies due to their gender/sex. However, female students' opinion is divided; 40% considers that women are not struggling whereas 35% considers that they are.

Another example can be seen in Figure 1 where the answers to two questions are represented in a surface plot. The horizontal axis corresponds to the agreement or not with the existence of evidences that there is a biased UPC teachers' treatment towards female students. The vertical axis indicates whether students consider that UPC female students are struggling with their studies more than men due to their sex or gender. In both cases, 5 indicates a total agreement while 1 corresponds to a total disagreement. A 0 score represents the empty answers (NA). Again, the bulk of male students (45%) consider that there is no gender bias whereas female students' perception is more diverse (27% disagrees, 13% agrees), showing a greater amount of gender issues' awareness.

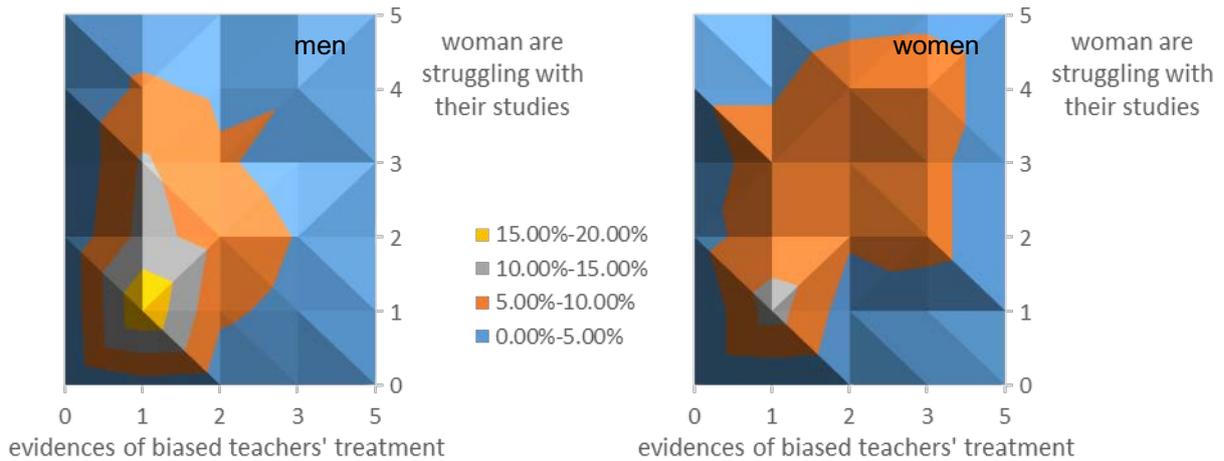


Figure 1: surface plots regarding teachers' treatment and women struggling, desegregated by sex

In general, it has been observed that students do not consider that UPC teaching staff uses a sexist language, but they also have not observed that teachers make any efforts not using a sexist language. These two opinions contradict each other. A possible explanation could be the misunderstanding of what sexist language means. In parallel, 18% of the female students detect the usage of a sexist language by the teachers and, at the same time, they do not detect any effort by the faculty to avoid it. Thus, not only UPC students have to be trained towards the usage of non-sexist language, but also UPC teachers. To this aim, several trainings for the teaching staff are being currently carried out at the UPC.

Other aspects regarding teaching methodology are assessed, including gender-biased expectations and gender-biased evaluation. As a whole, 30% of students consider there is one or more of these issues, but only 37% of them consider that it leads to a more struggling scenario for female students. Thus, a significant amount of students does not perceive the consequences of some gender biases. Nevertheless, 11% of students (and 21% of female students) consider that women find more difficulties along their studies, partly due to UPC teachers' treatment.

However, classmates can also contribute to a lack of equity along the UPC experience of students. Regarding the treatment observed by classmates, 17% of male students and 29% of female students have observed gender biased treatment. When considering the coupling between these observations and the consequences on the troubles that UPC female students can face along their studies, students' answers are again very gender-sensitive obtaining a similar plot as the one shown in Figure 1.

When desegregating data concerning teaching methodology and classmates' interaction by level of studies (i.e. BA or MSc) more biases are detected among Master's students. It is not clear, however, if such differences are caused by a higher level of awareness due to maturity or because more biases really exist.

The students' perception can constrain their interaction with the teaching staff both inside and outside the classroom. Regarding students' classroom participation, 34% of female students do not feel comfortable participating in the classroom. However, only 11% of men feel the same. At the same time, concerning the out-of-classroom interaction, specifically visiting faculty in their offices, the percentage of students that do not feel comfortable with these interactions is 9% for male and 18% for female students. Thus, female students do not equally participate to the learning process. The cause of these biases are not clear since several aspects might be relevant such as the gender of both teacher and student, the gender balance among all classmates and the gender-biased response by the faculty and classmates [8].

It is worth mentioning that, in the out-of-classroom faculty-student interaction, a significant difference is obtained between BA and MSc female students' results. Indeed, the percentage of female students that do not feel comfortable visiting faculty in their offices increases from 14% at BA degrees to 22% at MSc degrees.

Finally, when students were asked to propose new measures to achieve equity, the 91% of female answers and the 68% of male ones were related to facts that can be fully developed within UPC. For instance, to modify labor stereotypes, to raise awareness, to perform trainings, etc. The percentage of

students that consider that no gendered action is required represents the 6% of female students and the 22% of male ones. Finally, those that urge to include actions at the first levels of education (Primary school) represent the 3% of female and the 10% of male students.

One of these contributions that nicely summarizes the situation, authored by one male student, is:

“To give more visibility in order to make students aware of the clear inequality of opportunities that most women suffer compared to men, and to base the education on a more co-educational model, in order to encourage and motivate those women who they may feel disadvantaged and that this feeling will eventually lead them to a greater dropout after obtaining a university degree.”

3.2 Male and Female Referents

Referents can be related to career expectations [9]. Thus, for an equitable educational process, UPC must provide sufficient male and female referents to its students. In the survey, students were asked to indicate, separately, if they knew any male and female referent in their field of study and, in the case they do, to write the full name of the referent. From the survey's answers, it can be stated that 53,8% of the students have male referents but only 24.4% have female referents. Moreover, only 21.9% of students have both gender referents, whereas the 43.6% of students do not have any referent. This situation is far from being the desired one.

When comparing results from BA students and MSc ones, it is observed that the number of MSc students with male and female referents increase by 10%.

Regarding the type of referents, 7 categories have been defined: (1) personal circle, including the family, (2) UPC faculty, (3) recognized referent that has not contributed to the field of the studied degree and that has died before 1950, (4) recognized referent that has not contributed to the field of the studied degree and that has died after 1950 or is still alive, (5) recognized referent that has contributed to the field of the studied degree and that has died before 1950, (6) recognized referent that has contributed to the field of the studied degree and that has died after 1950 or is still alive, (7) null, the student has not been able to write the name of the referent despite affirming that he/she knows a referent.

In order to be considered a recognized referent, the person should appear in web pages excluding social media ones. Most of the recognized referents have done relevant scientific contributions but, in some cases some CEOs from private companies have also been accepted. Also, historical pirates or pilots have been considered as recognized referents.

Results of the classification show that the two types of male referents that predominate are the ones belonging to the personal circle (24%) and the ones that belong to the field of studies and have died after 1950 or are still alive (34%). However, these percentages differ substantially with sex. Indeed, males have mainly actual and within the field of studies male referents (38%) whereas females have mainly personal circle male referents (37%).

Regarding female referents, the situation is more sex-independent. In this case, the two predominant types of referents are from the personal circle (28.99%) and UPC faculty (18.12%). Thus, it can be said that female referents tend to be at lower level than men referents concerning career accomplishment. This fact supports the already observed theories concerning the explanation of the current pay gap [9][10].

4 CONCLUSIONS

The survey designed in the frame of the Gender Dimension in Teaching pilot project at UPC has allowed to gather information from students to understand their perception regarding gender discrimination in UPC MA and MSc studies. Results indicate that the bulk of the students consider that the UPC teaching context does not account for gender biases, neither in the teacher-student interaction nor among classmates. However, some needs and weaknesses have been observed from the answers of the survey.

Considering all students, referents, and especially female referents, is the major weakness. Female students mainly have referents (either male or female) from their personal circle. However, male students have mainly internationally recognized and actual male referents whereas their female referents belong to their personal circle too. These facts partly explain the students' career expectations and pushes the teaching staff to an urgent introduction of international female referents within their subjects.

Also, it has been observed that the female perception is more sensible to gender biases. Indeed, the equity score given to UPC by female students is always lower than the score given by male students. The bigger discrepancy among both sexes lays in the treatment received by classmates. Also classroom participation scores present significant discrepancies between male and female students. However, the score for the out-of-classroom participation (i.e. visiting faculty at their offices) is very similar for both sexes.

According to the above mentioned results, and pushed by the gender aspects included in the present legal framework [2], the definition and implementation of some gender actions is of utmost interest. Thus, not only faculty need to raise awareness on gender issues (by trainings, for instance), also students need to receive some training either by mainstreaming gender to all subjects and/or by the introduction to devoted subjects.

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