

Introducing a gender perspective in engineering degrees, a case of study in an Energy Markets course

David Ribó-Pérez^a, Paula Bastida-Molina^b, Carlos Vargas-Salgado^c, Cristian D. Chiñas-Palacios^d

^a Instituto Universitario de Ingeniería Energética, Universitat Politècnica de València, Camino de Vera s/n, david.ribo@iie.upv.es; ^b Instituto Universitario de Ingeniería Energética, Universitat Politècnica de València, Camino de Vera s/n, paubasmo@etsid.upv.es; ^c Departamento de Ingeniería Eléctrica, Universitat Politècnica de València, Camino de Vera s/n, carvarsa@upvnet.upv.es; ^d Departamento de Estudios del Agua y la Energía, Universidad de Guadalajara, México, daniel.chinas@academicos.udg.mx

Abstract

Although being mandatory since 2007, Spanish universities have not fully introduced a gender perspective in their degrees. This becomes even more critical in Science, Technology, Engineering and Maths (STEM) fields, where non biased information and objective knowledge is presupposed. Nevertheless, different studies reveal that the absence of role female models may be one of the reasons to lower engagement of women in STM degrees. In this paper, different techniques to approach a gender perspective in the engineering field are described. The introduction of a gender perspective activity in the course Energy Markets from the degree in Energy Engineering at the Polytechnic University of Valencia is presented and analysed. This activity is evaluated alongside the students through a series of semi structured questionnaires. Moreover, the situation and student expectations of the inclusion gender perspective in the whole degree is critically discussed with the valuable inputs of students.

Keywords: Gender perspective, STM, Energy Markets

1. Introduction

Gender inequality is currently seen as one of the main social issues globally. Women rights have been increasing in most parts of the world, especially in the developed countries. However, large gaps among gender equality can still be seen in several places and sectors. For instance, in Europe Women with higher studies suffer from higher unemployment rates and pay gap, which tend to increase with the age (EC, 2019). One of the sectors that has



been widely considered is the STEM. The gender perspective in STEM has been a topic of interest and discussion for many years now, where studies on reasons and percentages of women abandoning or not starting these careers and professions have been a topic of study (Flores Solano, 2016; Fouad, Singh, Cappaert, Chang, & Wan, 2016; Smith, Gayles, Smith, & Gayles, 2018).

Even though that numbers have been increasing in recent years, women represent just 20% of the engineering graduates and only 12% of the workforce (National Science Foundation, 2017). The reasons for the underrepresentation of women in these areas have been argued to be the lack of interest in technical areas, lack of confidence due to sexist environments and lack of role models (Fouad *et al.*, 2016; Smith *et al.*, 2018). These characteristics generate negative environments that can be appreciated as adverse for women.

In order to overcome this barriers different initiatives have been taken into account. For instance, European legislation included the gender perspective in the European funded research projects. And, several recommendations have been done to national states to include gender equality mechanisms in specific domains, including university degrees. The inclusion of a gender perspective in superior education has been a topic of interest in Spain since the incorporation of it in 2007. Nevertheless, studies of different universities conclude that no real integration of this perspective has occurred in the engineering degrees (Belén & Baena, 2018). Moreover, there is a lack of the impact assessment and the reception that this type activities have among students.

The innovation project hereby presented dwells with the inclusion of a gender perspective in an energy engineering degree. This project aims to explain how an activity was included and to understand the impact that these type of activities can produce among students. Moreover, the interest and acceptability of these type of activities among students is also presented.

This paper is structured as follows: Section 2 sets out a brief state of the art on energy studies with gender perspective; Section 3 presents the methodology used; Section 4 deals discusses the results; and finally Section 5 concludes.

2. State of the art

Gender inequalities are apparent in many major business sectors, but different analysis suggests that they are particularly acute within the energy sector, where larger gender inequalities exist (Ernst & Young, 2016). This result is particularly relevant when it comes to decision-making positions and boards. Moreover, studies suggest that women tend to be



more likely than men to express environmental concerns and boost investment on carbon emissions reduction.

A traditional approach defends that engineering and energy studies are gender-neutral. However, once a closer look is taken, it becomes clear that gender aspects are relevant and have been traditionally underestimated. Currently, the demand of energy is still highly dependent on gender and socioeconomic position (Sovacool, 2012).

Research on gender and energy issues has focused on the different uses of energy. Particularly, household-energy use in developing countries, energy poverty and women's positions and decision making within the energy industry have been studied topics (Pearl-Martinez & Stephens, 2016). Studies on gender and decision making in companies with larger women presence on their decisions board show that these companies tend to proactively invest in renewable energy and to reduce carbon footprint (Mcelhaney & Mobasseri, 2012). Moreover, the lack of women in decision making position in the industry has a large correlation with the lack of role models to choice STEM degrees.

3. Method and materials

A gender perspective activity was introduced in the course Energy Markets of the third and fourth courses of Energy Engineering at the *Universitat Politècnica de València*. These courses had a female presence of approximately one third, being this percentage larger than other engineering courses.

The activity was introduced during a three hour practical lesson that had as its main objective to understand how the marginal price of electricity was calculated in the Iberian Electricity Market (MIBEL). Prior to the mathematical formulation and data analysis, electricity regulation and how the market has evolved to its actual situation is explained. Therefore, it was decided that the gender and energy topic that had larger relationship with the course was the presence of women in decision-making position, both in the private and the public sector.

During the theoretical explanation of the legal evolution of electricity markets, a public discussion over the underrepresentation of women was introduced by the teacher, inviting the students to show their opinions. An open discussion on how they saw the situation of gender balance on the energy industry. After a first round of opinions specific data with female presence on decision-making positions was presented and explained to the class. The data was obtained from the Women in Power and Utilities Index report (Ernst & Young, 2016) and a summary of it can be seen in Figure 1.



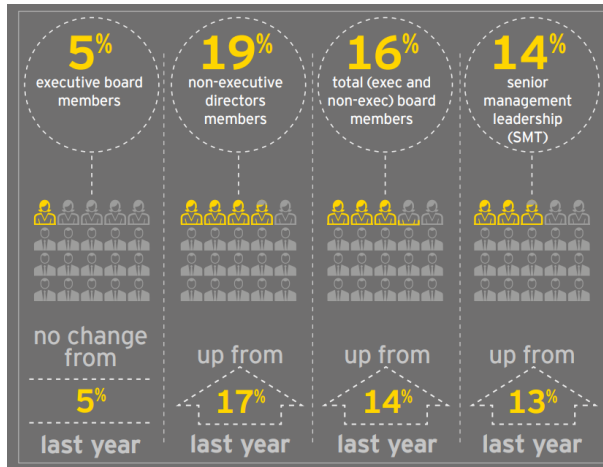


Figure 1. Percentage of women in decision-making positions (Ernst & Young, 2016)

Regarding the presence of women in the public service, it was presented how from the 9 ministers that have been responsible of the energy department in Spain since the Democratic Transition occurred, only the last one has been a woman. The current Spanish minister of ecological transition, from which depends the energy department, is Teresa Ribera. She is an well-known international professional on the sector that used to be the director of the Institute for Sustainable Development and International Relationships of Paris and worked as an advisor for the United Nations Framework Convention on Climate Change (UNFCCC). However, most of the students did not know who she was when they were asked. After the presentation of results a new round of opinions was opened were the students that could answer again about the information treated.

a. Interview structure

In order to assess the interest, acceptance and perspective on the topic, a semi structured questionnaire is used. This has been built with Google Forms and can be consulted in Spanish¹. The following questions have been answered anonymously by eleven students out of sixty, both male and female when the course was finished, a couple of months after the session. Due to the small sample of voluntary answers, the results presented here are exploratory and just provide a first approach to the perception among students of gender perspective in engineering. The small and voluntary sample could show biased results of more interested students on the topic. Additionally, women answers are 63%, being

¹ https://docs.google.com/forms/d/1aXyESi8c_kg4xs9tzqRjLmtFJoOXmjQqfnwJT9ejb0

overrepresented in the study compared with the class structure. The questions asked are the following:

Table I. Questionnaire to evaluate the activity

What is your gender?

<input type="checkbox"/> Female	<input type="checkbox"/> Male	<input type="checkbox"/> Rather not answer	<input type="checkbox"/> Other:
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Do you think that gender perspective is important?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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Do you think that an energy engineering degree should have a gender perspective?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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Would you like it?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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Did you learn anything new about gender perspective in energy with the activity carried out?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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How did the activity affect over your interest on the topic?

<input type="checkbox"/> Increased my interest	<input type="checkbox"/> Did not affect my interest	<input type="checkbox"/> Decreased my interest
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What is your perception about gender inequality in the energy sector after the activity?

Open answer.

In your opinion, what could be done to increase the gender perspective in the degree Energy Engineering?

Open answer.

4. Discussion

The discussion with students took place during 3 sessions of around fifteen to twenty-five students each one. The students did not participate much during the first round of questions. However, their participation increased after showing the statistics presented. The activity

went well and generated no conflicts or disagreements. Moreover, positive feedback was provided personally about it.

Regarding the opinions of the students, Figure 1 presents the interest that students have expressed on gender perspective, which did not substantially varied depending on their gender. Even though that having a small sample, more than 90% of the students believe that gender perspective is important and should be taken into account. These numbers contrast with the perception that students have over the inclusion of gender perspective in the degree, where more than 80% of them state that does not have.

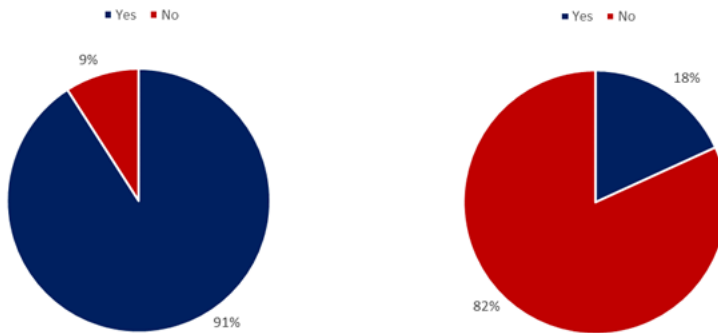


Figure 2. Percentage of students that believe that gender perspective is important (left). Percentage of students that think that gender perspective is included in the degree (right).

On the other hand, again, more than 80% of the students express that they would like that the engineering degree included gender perspective. This opinions result interesting due to the fact that no gender perspective is normally included in engineering degrees even though that the results indicate that students would like to receive this kind of training.

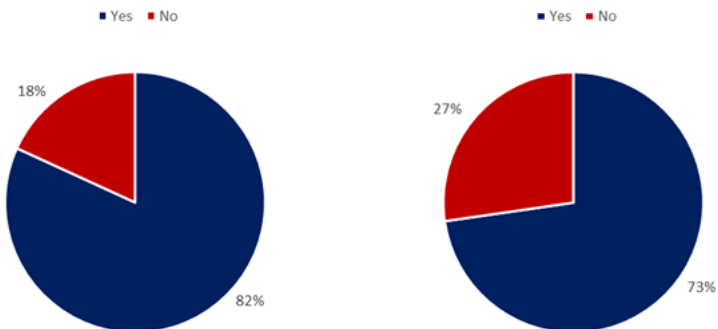


Figure 3. Percentage of students that would like to include gender perspective in the degree (left). Percentage of students that state that they learnt something new with the activity (right).

Regarding the proposed activity, the acceptance among students remained quite positive. More than 70% of the students stated that they learnt something with it and also more than 70% of them expressed that after it have more interest than previously. Another interesting conclusion is that the people that no one expressed that after the activity their interest on the topic decreased.

Regarding the open answer to the situation of women on the energy field, the students expressed their concerns about the lack of information and the current situation of the sector and other sectors such as science and research. Concerns about how these sectors are seen as male professions in society was also mentioned.

■ Increased my interest ■ Did not affect my interest ■ Decreased my interest

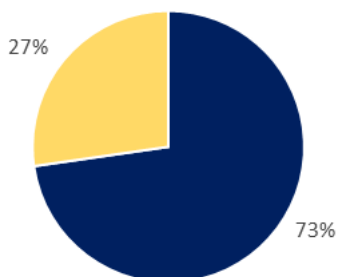


Figure 4. Percentage of students that reflect how it changed their interest on the topic

On the other hand, some answers expressed that inequalities do not exist in this field and it is just about the academic and professional background of the people. Although not being a majority, some voices expressed also that no gender perspective should be included in engineering fields.

Finally, most students mentioned that these types of activities should be done and promoted. Moreover, petitions to include female role models were mentioned a couple of times, showing how the requirements among students align with the recommendations analysed in the literature. Some of the ideas proposed by the students are:

“It would be interesting to talk about women who are models in the engineering field, more specifically on the energy field.”

“It would be interesting to visualise this share of women who hold these decision-making positions, showing the inequalities to get people aware of it and to have role models.”

5. Conclusions

This communication presents an activity with gender perspective performed in the course Energy Markets. After its explanation and the decision on how was selected the activity, the results of a survey among the students are presented. Due to the low sample, the presented results are tentative and have to be considered with caution. Nevertheless, they seem to provide two main conclusions. First, no gender perspective is appreciated, by students, to be included in the engineering degrees as the literature says. Second, most of the students believe that this topic is important and would like to see it more in the courses with activities such as the presented. Students also highlight that exists a lack of information and these activities help them to know more on the topic. Finally, it results crucial to deep the studies on the topic. More studies are recommended since it exists a knowledge gap on how students perceive and evaluate activities with gender perspective in engineering courses. A perspective that different studies suggest that is essential to improve the quality of the superior education and help younger generations to have role models in the engineering fields.

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