

Including Gender Dimension in Operations Management Teaching

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Received: October 2023

Accepted: April 2024

Abstract:

Purpose: This paper aims at introducing the importance and the relevant concepts and tools for including gender dimension in teaching, with a special focus in the Operations Management knowledge field.

Design/methodology/approach: The methodology is based on a literature review and on the knowledge and experience of the authors in teaching in the field of Operations Management and designing and implementing trainings and pilot programs for including gender dimension in teaching.

Findings: Even if there already exist some general guidelines for including gender dimension in teaching and in some countries the law requires the inclusion of gender dimension in high education, the effective inclusion of gender dimension in teaching is still in a very preliminary stage. Moreover, there are not specific studies focused on the Operations Management field.

Research limitations/implications: Even if the authors have wide experience in the field, the proposals have not been applied to many courses so there is no empirical evidence of the achieved results.

Practical implications: The paper can be useful for people teaching in Industrial Engineering and Operations Management courses', as it gives not only some general guidelines and concepts but also specific examples that can be directly applied to their courses.

Social implications: Including gender dimension in Industrial Engineering and Operations Management courses, which are still male dominated, can help achieving the SDG 5, which is focused on achieving gender equality and empowering all women and girls. Specifically, including gender dimension in teaching allow breaking stereotypes, changing the image of the knowledge field, empowering female students and giving both men and women tools for including the gender dimension in their professional careers.

Originality/value: There exist some general guidelines for including gender dimension in teaching but, to the best of our knowledge, there is no any specific work that is focused on the Operations Management knowledge field.

Keywords: operations management, gender dimension, teaching

To cite this article:

Lusa, A., Peña, M., & Mas de les Valls, E. (2024). Including gender dimension in operations management teaching. *Journal of Industrial Engineering and Management*, 17(2), 373-384. <https://doi.org/10.3926/jiem.6794>

1. Introduction

The Sustainable Development Goals (SDGs) were adopted by the United Nations General Assembly in September 2015 (United Nations, 2015) as part of the 2030 Agenda for Sustainable Development. In particular, the SDG 5 is focused on achieving gender equality and empowering all women and girls. It aims to eliminate all forms of discrimination and violence against women and girls, promote equal access to education, healthcare, and economic opportunities, and ensure their full and equal participation in decision-making at all levels. When the majority of university teaching centers have already strengthened and consolidated their study plans, the next challenge is to include and ensure that all people have the same opportunities to progress in education. Universities are working on the introduction of the gender dimension in teaching, as a part of their Gender Equality Plans (GEPs). Indeed, through teaching with a gender dimension one expects to reduce the gender biases among students, to avoid the stereotyped roles in teamwork, and, as a whole, to generate the proper atmosphere and culture to enable students to develop gender equality skills and to include equity in their future professional careers (Murphy, 1999). This is especially important in male dominated fields, as is industrial engineering (Harris, Rhoads, Walden, Murphy, Meissler, & Reynolds, 2004, Bothwell, Chinchilla, Deraze, Ellis, Galán-Muros, Gallegos et al., 2022) and, within this, Operations Management (for the purpose of this paper it is considered that this may include supply chain design and management and, as an instrumental tool, quantitative methods or analytics tools).

STEM field is not male dominated worldwide, but depends on context-related aspects. Indeed, several Asian countries have high proportions of women in STEM subjects. In Africa, an equal sharing among different areas is found. In Europe, the same global trends are observed, according to She Figures 2021 report (European Commission, 2021). Indeed, in 2021 the two fields of education that had a lower female students' percentage were ICT and Engineering, with 20% and 25% of enrolled female students, according to Eurostat data. These percentages have only increased between 1 and 2% since 2015. More specifically, in Spain, the Científicas en Cifras 2023 report shows the percentage of female students at different Spanish Bachelor degrees, obtaining only a 25.6% of female students in Engineering and Architecture areas, as shown in Figure 1.

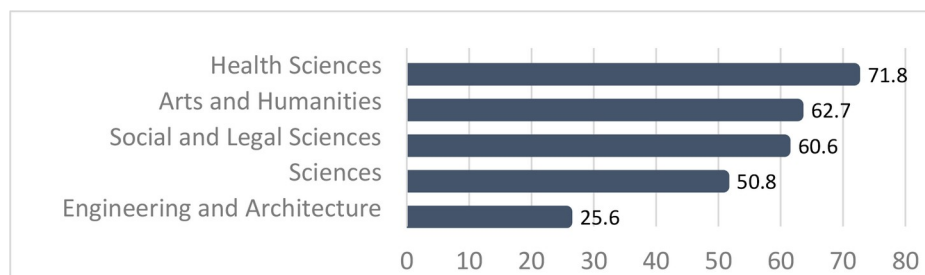


Figure 1. Percentage of female among Spanish Bachelor students (Unidad de Mujeres y Ciencia, 2023)

Addressing gender inequality in higher education is a global concern, and various countries, including those in Europe, have implemented policies to increase women's representation in academia. Firstly a general framework for higher education policies addressing gender inequality in Europe is provided, then we will focus on the Spanish example, specifically Catalonia.

Many European countries have enacted legislation to promote gender equality in higher education. These laws often include provisions for equal opportunities, pay equity, and representation on decision-making bodies. Some countries have set targets or quotas for the representation of women in academic positions and leadership roles, institutions are required to work towards achieving these targets. Gender mainstreaming involves integrating gender perspectives into all policies and activities; this approach ensures that gender equality is considered in all aspects of higher education, from curriculum development to recruitment processes. Various support programs may be in place to encourage women to pursue academic careers, providing mentorship, networking opportunities, and funding for research projects. Regular monitoring and reporting on gender representation and equality indicators help assess the effectiveness of policies, institutions are often required to submit gender-disaggregated data.

Training programs and awareness campaigns aim to eliminate gender bias and stereotypes, fostering a more inclusive and supportive academic environment.

Spain has several laws promoting gender equality. The Organic Law 3/2007 (2007) for effective equality between women and men is a key piece of legislation. It covers various sectors, including education. Many laws and regulations already impose the introduction of the gender dimension in curricula. For example, the University Quality Agency in Catalunya (Spain) requires universities to include gender-specific learning outcomes wherever appropriate (AQU Catalunya, 2018). This requirement is applicable for all university degrees, supervised during its accreditation but also at its follow-up (compulsory processes belonging to the quality assurance field). In some universities, such as the Universitat Politècnica de Catalunya – UPC (2023) in Spain (a public university in the fields of Engineering, Science and Architecture), where the percentage of female students remains too low, the following gender skill was approved in April 2020 by the Governing Council and has to be progressively included in all Bachelor and Master studies: “To know and understand, within the scope of the degree itself, inequalities based on sex and gender in society; To integrate the different needs and preferences based on sex and gender in the design of solutions and problem solving”. However, even if the requirements and the knowledge are there (see, for example, the guide by Mas de les Valls & Peña, 2022), the fact is that the inclusion of gender dimension in teaching is still in a very preliminary stage (Poggio, 2018). The objective of this paper is to provide some basic concepts and specific examples for university educators in the field of Operations Management.

The following one is the research question considered in this study:

- How can be gender dimension integrated in Operations Management courses?

The organization of the rest of the paper is as follows: section 2 includes a literature review on gender dimension in teaching; section 3 exposes the four pillars of gender dimension in teaching (contents, methodology, learning environment management, and assessment processes); section 4 gives some illustrative examples for the Operations Management field; finally, section 5 contains the main conclusions.

2. Literature Review

The cause of the lack of female students' enrolment in STEM degrees has been extensively studied. It is widely accepted that a multiplicity of constraints influence on the female students' enrolment decision, including the perception of a lesser ability in maths and ICT, a lower self-concept compared to their male counterparts, persistent gendered stereotypes in the society and the lack of female outstanding personalities, among others (Wang & Degol 2017, Sáinz, Fàbregues, Rodó-de-Zárate, Martínez-Cantos, Arroyo & Romano, 2020, Fernández-García, Torío-López, García-Pérez & Inda-Caro, 2019, Merayo & Ayuso 2022). In Calvo, Epifanio, Estrade and Mas de les Valls (2022) a revision is exposed on gendered stereotypes in Engineering, Physics and Mathematics within the Spanish context. The individual and object-oriented work without a focus on its final benefit for the society is the dominant stereotype in Engineering, coinciding with the findings reported by Merayo and Ayuso (2022). In Sáinz et al. (2020) it is found that social utility values associated with the STEM field and educators' encouragement were predominant factors for women compared to personal values and the role of family tradition and mass media for men.

Once the female students enrol these Engineering studies, a second barrier appears. They are a minority group in a male-dominated context. They might experience gender biased expectations and treatment by educators and mates (Hughes 2000, Meadows & Sekaquaptewa 2014, Mas de les Valls, Alsina, Ventura & Lusa, 2020), face difficulties in class participation (Tatum, Schwartz, Schimmoeller & Perry, 2013, Aguillon, Siegmund, Petipas, Drake, Cotner & Ballen, 2020), report a lower sense of belonging (Wilson and VanAntwerp, 2021), among others.

Feminist pedagogy provides with the theoretical framework to overcome the above-mentioned issues. According to Webb, Allen and Walker (2002), the six principles of feminist pedagogy are: reformation of the relationship between educator and student, empowerment, building community, privileging voice, respecting the diversity of personal experience, and challenging traditional pedagogical views. It offers an inclusive teaching methodology, making the environments more dialogical, inclusive, and student-centred (Jiménez-Cortés & Aires, 2021).

According to Hutchison (2021), feminist pedagogy implies paying attention to learners' emotions throughout the learning process.

The challenging perspective that the feminist pedagogy provides affects all aspects of teaching, as explained in the following section. But a feminist point of view also colours those concepts inherent in industrial engineering and Operations Management such as leadership, team management, and success, among others. As stated by Sila (2022), the formal and powerful attributes of the classical concept of leadership is being transformed by feminists into an informal, organic, emergent, situational, collective and collaborative concept. Also, a feminist perspective to stakeholder theory (Donaldson & Preston, 1995) is being recently developed, especially in the corporate social responsibility field as discussed by Grosser and Moon (2019) and Sila (2022). In their work, the feminist ethics of care is considered the normative core for the stakeholder theory. Thus, the focus is shifted from the principals of individual rights or duties to relationships.

3. The Four Pillars of the Gender Dimension in Teaching

The incorporation of the gender dimension in teaching involves recognizing and addressing gender-related aspects in educational content, methods, and environments. The pillars of the gender dimension in teaching encompass various dimensions that contribute to fostering gender equality and creating an inclusive learning environment. To include gender dimension in teaching does not only mean to consider sex and gender in its course contents, but also in the teaching methodology, the learning environment management and the assessment processes, as it is well explained by Peña, Olmedo-Torre, Mas de les Valls and Lusa (2021). In addition to the previous ones, some additional pillars could be considered (Palmén, Arroyo, Müller, Reidl, Caprile & Unger, 2020): support systems (mentorship programs; resources and networks), professional development for educators (gender sensitivity training, updating teaching materials), and research and data collection (gender-disaggregated data, gender-inclusive research practices). This research focused on the four essential pillars of curriculum development in accordance with the AQU framework document (AQU Catalunya, 2018).

Regarding the course contents, it has to be analyzed if sex and/or gender aspects are relevant to the subject; also, if the impact of gender patterns on aspects such as health, mobility, safety, etc., can be considered when referring to potential users. Note here that “sex refers to biological qualities characteristic of women and men, boys and girls, in terms of reproductive organs and functions based on chromosomal complement and physiology. Gender is a socio-cultural process. It refers to cultural values and social attitudes that together shape and sanction “feminine” and “masculine” behaviors, and also affect products, technologies, environments, and knowledge. It includes gender roles, attitudes and identities” (European Commission, 2016: page 7).

As for the teaching methodology, an inclusive language should be used. Also, gender stereotypes should not be reproduced in terms of examples or iconography. Finally, references to female authors are to be included. Introducing female references in the course content is one of the most prevalent actions from a gender perspective in teaching. Simultaneously, it represents a readily achievable step towards addressing this issue. This situation, which pertains to the role models for our students, can significantly influence their professional aspirations, making it imperative to promptly implement measures in response. Apart from that, selecting research inquiries, shaping conceptual frameworks, and formulating hypotheses are not devoid of values, and frequently, preconceived notions influence the choices made in the research methodology.

Options to mitigate gender biases in learning environment management include promoting a balanced participation of students and their self-esteem (in male dominated fields female students feel less confident to participate); involving students in the choice of interaction modalities; and avoiding the reproduction of gender stereotypes through the use of certain examples or a division of tasks according to traditional gender patterns.

The last pillar is the assessment processes. Learning outcomes are not solely shaped by the curriculum; they are equally influenced by the methods of assessment. Some research underscores the potential for enhancing assessment practices in higher education through improvements in assessment design. Feedback, participation, empowerment, and self-regulation are recognized as factors that mediate the impact of assessment quality on learning, as pointed in (Ibarra-Sáiz, Rodríguez-Gómez & Boud, 2021). The methods for evaluating both students

and teaching staff are also affected by biases of different kinds. There is an extensive literature on gender aspects according to the type of examinations and educator intervention in the evaluation, pointing to the role of the formulation of the questions, the general framework for the evaluation or the type of oral interaction. When it comes to assessment, numerous studies delve into various gender-related aspects of evaluation experiences. For instance, research in Pekkarinen (2015) and Riener and Wagner (2017) demonstrate that women tend to perform less effectively in multiple-choice tests that impose negative penalties for incorrect answers, primarily due to lower self-esteem. Educators do not have a monopoly on gender biases: when evaluating, students express strong biases to the detriment of female educators.

Moreover, there is substantial evidence indicating that women tend to underperform in various competitive contexts compared to men. This not only affects assessment processes but also influences teaching methodologies and learning environment management (e.g., classroom participation, individual or group work, etc.). Implementing inclusive teaching strategies and fostering specific classroom characteristics have been proven to enhance students' social engagement (Aflalo 2018, Zurbriggen, Hofmann, Lehofer & Schwab, 2021).

In summary, when integrated into teaching, a gender dimension entails a reflective process that influences the development of competencies and skills within the curriculum, course design, the content covered, examples provided, language choices, resource selection, assessment methods, and the management of the learning environment.

4. Illustrative Examples for Operations Management Courses

As it has been mentioned, there exist some guides and tools that, with the proper trainings and raising awareness campaigns, can help university educators introducing the gender dimension in their courses. However, none of those guides are focused on Operations Management field and, whilst indications for the methodology, learning environment management and assessment pillars might be applicable to most knowledge fields, it is obvious that indications for approaching the contents pillar have to be designed for each specific field. For doing that, both knowledge on gender dimension in teaching and the specific field are needed. The authors have much experience in research and trainings on including the gender dimension in teaching; of course, some of the authors belong to the Operations Management field, so the team has been able to conduct research and a reflection process in order to propose specific examples for including the gender dimension in the Operations Management courses. In this paper, it is considered that such courses may include supply chain design and management and, as an instrumental tool, quantitative methods or analytics tools. To our knowledge, neither research nor education published works deal with this specific goal.

In this section, specific indications for including gender dimension in Operations Management courses are given. For the contents pillar, some illustrative examples are given. While it is not our aim to provide an exhaustive list of examples, we believe that the included compendium is broad enough for any educator in the field of operations management to find examples to use in their courses, thus helping students to break gender stereotypes and to learn to include gender dimension into their future projects as professionals.

4.1. Introducing Female Referents

The lack of female referents in the STEM field, together with the existing stereotypes, has been pointed out since many years as one of the main barriers for increasing the number of female students in this field. These female referents include female professionals and also female authors that have contributed to the field.

It is important to include the whole name so students can see that there are female authors within the proposed bibliography of the course. Note that doing this it is not always an easy work; from one side, because women have been historically made invisible (often by assigning their contributions to a male researcher or professional) and, from the other side, because many papers lack the complete names of their authors. Regarding this issue, it has to be highlighted and acknowledged that nowadays many journals ask for full names rather than relying on initials; the reason is not only for avoiding confusion or ambiguity when multiple authors share the same initials, but also for ensuring equitable representation in the academic community. Those journals ask for this as a part of a wider

gender equity policy, in which they ask also for a non-sexist or inclusive language or taking sex and gender as variables in research analysis.

Of course, besides female researchers, there are some outstanding women that should be highlighted in Operations Management courses; for example, Lillian Moller Gilbreth (1878-1972), one of the first female engineers to earn a PhD and that is considered to be the first industrial/organizational psychologist. She worked with her husband (Frank Bunker Gilbreth) and continue their works after he died. They were efficiency experts who contributed to the study of industrial engineering, especially in the areas of motion study and human factors (see Lancaster, 2004).

4.2. Breaking Gender Stereotypes in Images, Examples and Cases

In the Operations Management courses, it is common to solve problems and cases in which people appear. Traditionally, managers and directors are shown as men whilst administration staff is referred to as women (both in language -specially in those languages that have the masculine and feminine forms- and images). Also, when talking about workers in assembly lines or manufacturing those are assumed to be men (with the exception of quality processes workers, which use to be shown as women). Introducing gender dimension means using language, image, examples and case studies to break those stereotypes.

4.3. Including Sex and Gender Dimension in the Contents

Operations Management courses refer mainly to the design, planning and scheduling of logistic and production systems (namely, supply chains); the field covers a wide range of topics and below a selection of them is included, as illustrative examples. Remember that one of the main objectives is to make students be aware of the possible gender differences that should be considered when designing solutions.

4.3.1. Facility Layout

This is a classical topic in which different configurations are explained (basically the product and the functional oriented layouts, or hybrid layouts) and solving methods are introduced (such as the Systematic Layout Planning by Muther, 1961). Typically, the study is only focused on manufacturing sections but educators could take the explanation of this subject as an opportunity to introduce the gender dimension talking and debating different relevant topics, such as the ones below:

- Designing restrooms that are inclusive of all genders and that can reduce gender stereotypes. This could include gender-neutral or all-gender restrooms, in addition to traditional male and female restrooms. Providing sanitary disposal units in all restrooms, having baby-changing facilities in all-gender restrooms, and ensuring privacy and safety are key considerations. This topic can lead to an interesting debate since the separation of public restrooms into male and female facilities has historical roots and is largely based on societal norms, cultural practices, and historical perceptions of gender roles; some individuals may feel uncomfortable or resistant to the idea of including all-gender restrooms due to cultural or personal beliefs.
- Creating flexible and accommodating work environments that consider the needs of diverse gender identities. This might involve offering various seating arrangements, quiet spaces, and ensuring inclusivity in office design, such as providing breastfeeding rooms or private spaces for personal needs.
- Ensuring that changing and locker room facilities accommodate diverse gender identities. This could involve designing private changing spaces or providing curtains for changing areas to ensure privacy and inclusivity.
- Considering lighting and security measures that cater to the safety concerns of all genders. Ensuring well-lit areas, clear pathways, and security measures that make everyone feel safe and secure, regardless of gender.
- Ensuring that facilities are accessible to all genders, including individuals with disabilities. This involves creating spaces that are wheelchair accessible, providing support for people with mobility challenges, and ensuring ease of access for everyone.

4.3.2. Workplace Design and Methods-Time Measurement (MTM)

Methods-time measurement (MTM) is used to estimate the amount of time that it will be needed to perform a manual task or operation. The first method was introduced by Maynard, Stegemerten and Schwab (1948) and since then many variations have appeared and the first ones have become obsolete. For many years, physical differences between men and women have not been considered at all, taking the average white man dimensions and characteristics as a basis for estimations. Also, temporary situations, such as a pregnancy, have not been considered.

When integrating the gender dimension into methods and time measurement, it is important to consider the diversity and unique needs of individuals, rather than assuming a one-size-fits-all approach. This can involve conducting studies, surveys, and analyses to understand how different genders may experience work processes differently, and adapting methods time measurement accordingly. The need to consider gender dimension should be pointed out discussing for example the following points:

- Physical differences and ergonomic assessments: Different genders might have diverse physical capabilities; for instance, tasks that involve heavy lifting, reaching, or repetitive motions may be impacted by physical strength and body sizes that can vary between genders. Therefore, time measurements should consider these differences to ensure fair and accurate assessments. Methods time measurement should also account for ergonomic variances in posture, reach, or comfort levels for individuals of different genders.
- Environmental factors: Certain environmental factors might affect different genders disproportionately. For example, temperature sensitivity, noise levels, or lighting conditions might impact work efficiency differently for individuals of various genders.
- Mental load and emotional labor: Acknowledging the additional mental load or emotional labor that might be associated with certain tasks for different genders. This could involve time allowances for communication, emotional support, or tasks that are traditionally more associated with one gender.

When dealing with this topic, educators should point out these issues, and also emphasize that most body of knowledge has been built without considering sex and gender, this is, being gender blinded, and that this is not only unfair to women, but also leads to incorrect results and poor quality.

4.3.3. Assembly Line Balance and Design and Task Allocation

When dealing with assembly line balancing methods subject, educators could also explain that, once the line has been designed, workstations have to be designed and workers have to be allocated to workstations, and that gender dimension should be included in all these tasks.

In assembly line balancing, considering the gender dimension involves recognizing potential differences in physical abilities, preferences, and ergonomics that can impact efficiency and comfort in work. Below some examples of how gender considerations can be included in assembly line balancing are described:

- Task allocation and rotation: Consider that different genders may have varying physical abilities and strengths. When balancing assembly line tasks, consider rotating tasks to accommodate these differences. Some tasks might require more strength, while others might necessitate precision or dexterity. Rotation can prevent overburdening individuals and accommodate diverse abilities.
- Ergonomic considerations: Design workstations that are adjustable to fit various body sizes and shapes. Consider the physical differences between genders in terms of reach, height, and strength. Adjustable seating, work surfaces, and tool positioning can accommodate these differences.
- Workplace design and layout: Ensure the assembly line layout is conducive to the needs of individuals of all genders. This might include considering the arrangement of equipment, accessibility of tools, and ensuring there's enough space for different body sizes to move comfortably without physical strain.
- Tools and equipment design: Select tools and equipment that are ergonomically designed to suit diverse individuals. This involves considering grip size, weight, and ease of use to accommodate varying physical strengths and preferences.

- Training and support: Offer training that accommodates different learning styles and preferences. Some individuals might benefit from hands-on training, while others may prefer written or visual instructions. Catering to diverse learning styles can improve task efficiency.
- Breaks and fatigue management: Recognize that fatigue might affect individuals differently. Ensure adequate breaks to prevent physical strain and exhaustion. This could include adjustments in break frequency or duration based on task requirements and physical demands.
- Safety and health measures: Implement safety protocols that consider the different physical requirements and potential risks for different genders. This involves ensuring safety measures account for varying physical strengths and vulnerabilities.

It's important to note that while these considerations aim to be inclusive and accommodate the diversity of individuals, it is crucial to avoid assumptions about physical abilities solely based on gender. Not all individuals of a particular gender will have the same physical capabilities. As such, using a combination of ergonomic principles, feedback from workers, and ongoing adjustments based on performance and comfort is crucial for effective assembly line balancing.

4.3.4. Working Time Planning

People are one of the most important resources in a production system, and working time planning and shift scheduling are usually approached so its use is optimized, taking advantage of flexibility and avoiding its waste. Gender dimension can be included by considering, among others: work life balance (for all workers, not only for women, so men are pushed to become more responsible of home and family care tasks); part time workers and working time reductions (nowadays most part time jobs and working time reductions are taken by women, take the opportunity to debate about its reasons and the consequences); teleworking; and starting and/or finishing times (women suffer more violence than men, so if they have to walk during night hours in a solitaire area, the risk of being attacked increases for them more than for men). Below some specific points are discussed:

- Work-life balance: Of course, it should be recognized that certain shifts or schedules might impact different genders uniquely. Providing options for shift preferences or fair rotation systems can help accommodate varying needs. Some individuals might have caregiving responsibilities or other commitments that affect their availability. Provide flexible shift options or allow employees to indicate their preferred shift timings to accommodate varying needs.
- Health and safety: Gender-specific health needs and safety concerns should be also considered when planning work schedules. For instance, scheduling breaks or adjusting workloads for tasks that might affect physical health differently between genders can be an important consideration.
- Commuting: Students should be aware that it might affect individuals differently. Providing options like flexible start and end times to avoid peak commuting hours or offering work-from-home alternatives can assist in managing commute-related stress. Remote work, when feasible, can also support individuals who might face challenges related to childcare, or other household responsibilities, ensuring more equitable access to job opportunities and reducing commuting time that might affect individuals of different genders differently.

If working hours and/or shift scheduling are planned and assigned by means of an algorithm (either an optimization one or a heuristic), this could include all the above as criteria and/or constraints, rather than just considering a cost minimization.

4.3.5. Route Design

Normally route design is solved by means of graph-based algorithms (which is part of many Operations Management related courses), which basically try to minimize time and/or cost. However, patterns of mobility exhibit gender distinctions. Often, conventional gender roles, distinct divisions of labor within households, and inequalities in resources persist. The gender-specific responsibilities within households play a significant role in travel demands. Tasks related to domestic care, managing the household, running errands, or tending to others

differ from the daily commute to work. Safety concerns also factor into this equation. Meanwhile, advancements in urban transportation are introducing smart mobility solutions facilitated by information and communication technology (ICT) platforms. These are aimed at simplifying access to transportation services and tailoring modern transit experiences. Regrettably, these advancements have predominantly overlooked gender considerations (Nobis & Lenz, 2005).

When explaining route design theory or working in a case study, educators could arise the following topics:

- **Safety:** Ensuring well illuminated pathways and streets is crucial, especially during the night. Women, in particular, might feel more vulnerable in poorly lit areas. Designing routes with adequate lighting and clear visibility can enhance safety for all users. Also, women might feel more comfortable in areas with higher foot traffic, visible security, and proper surveillance so open areas, community centers, and well-maintained parks can be included in the route.
- **Accessible facilities:** Ensure access to public restrooms, especially for women, along the route. Properly maintained and safe restroom facilities are important for the comfort and safety of all users, particularly women and families with young children.
- **Diverse transportation modes:** Design routes that accommodate various transportation modes to cater to different needs. For instance, women might prefer safer and more accessible public transportation options, such as well-lit bus stops or train stations.
- **Route connectivity:** Planning routes that connect essential facilities like healthcare centers, schools, shopping areas, and community spaces to ensure convenient access for individuals of all genders.
- **Inclusive urban planning:** Incorporate a mix of amenities and services along the route, such as grocery stores, pharmacies, childcare centers, and schools. This helps create a more inclusive environment and reduces the burden on women who often undertake household responsibilities and caregiving.
- **Designing for accessibility:** Consider accessibility in route design, such as ramps, elevators, and seating areas, catering to the needs of pregnant women, the elderly, or people with disabilities.

There are some projects that have worked on this issue, and there are case studies that could be used in the teaching (see, for example, Schiebinger, Klinge, Paik, Sánchez-de-Madariaga, Schraudner & Stefanick, 2011-2020).

4.4. Designing Problems and Examples for Raising Awareness

Educators can also design problems and examples that besides helping the understanding of the course concepts, serve also to raise awareness towards the existing inequalities between men and women. A couple of examples used in a quantitative methods course (showing also real and updated data to students) are given below.

- Design an optimization model for determining the weights of a multi-factor job evaluation system to guarantee that certain jobs have the same value (factors include required knowledge and skills, physical, mental and emotional effort and responsibility). The law imposes that jobs of equal value have to be given an equal salary; the example starts saying that a judge has determined that certain works have the same value and, taking as a data the evaluation of each job at each factor, a mathematical model is designed for determining the weight of each factor. The example is used to raise awareness about the existing pay gap between men and women; part of this is due to the fact that male dominated jobs are given more value than female dominated jobs, both because factors more predominant in male dominated jobs are given a higher weight and also because factors that are more important in female dominated jobs are undervalued.
- Design an optimization model for selecting the people to be hired and including, besides many conditions, that the resulting workforce has to be gender balanced (considering that each sex must be between 40% and 60%). This example can be used to raise awareness about the inequalities that women still face when applying to certain positions.

5. Conclusions and Future Research

With the evolution of laws, teaching and research staff has to include the gender dimension both in teaching and research. Doing this in a proper way will not only increase the quality and relevance of their tasks, but it will also help reaching a more egalitarian society, because the current students are the ones that will design and implement policies, products and technology in the near future. Most universities are still in a very preliminary stage, but there already exist many resources that can help speeding up the process. In this paper we have given some specific examples that can be used or inspire educators in the field of Operations Management.

This study can be useful for people teaching in Industrial Engineering and Operations Management courses'. The most important topics of this work are summarized here: explore how incorporating the gender dimension affects the quality and relevance of tasks performed by students in Operations Management; identify challenges faced by educators in integrating the gender dimension into Operations Management courses and propose potential solutions; and evaluate the effectiveness of guides and tools proposed in recent years for gender integration and identify additional resources that enhance the process.

It is important to acknowledge some limitations of this study focused on the impact of integrating the gender dimension in Operations Management courses. First, the study's findings may be context-specific and may not be easily generalized to different academic institutions, cultural settings, or countries. Second, the effectiveness of integrating the gender dimension could vary across institutions based on their existing policies, curriculum structures, and the level of commitment to gender equality. Third, external factors, such as societal changes or policy shifts, may also contribute to the observed outcomes. Finally, Operations Management as a field may evolve, and the relevance of gender integration may change over time. The above considerations provide context for interpreting the findings and suggest avenues for future research.

Our future research includes using surveys to analyze the impact of introducing gender dimension in Operations Management courses, as a way of validation of the guides and tools that have been designed and proposed the last years, and the specific directions given in this paper for the Operations Management field.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The work has been partially funded by the Encarna Sanahuja Yll Award, given by the Government of Catalonia (2020).

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Journal of Industrial Engineering and Management, 2024 (www.jiem.org)



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