Gender in human factors education: A pilot study

Rich C. McIlroy

Transportation Research Group, University of Southampton, UK, SO17 1BJ

SUMMARY

Women are chronically underrepresented in engineering. Some have argued that greater emphasis of the social relevance of engineering could help address the challenge. Human factors and ergonomics (HFE), in its focus on the human in the system, does just this. Could HFE therefore help us solve the engineering gender challenge? How is HFE currently performing in terms of gender equity? This study used surveys and interviews with students and educators to explore these issues. Participants highlighted the need for institutional guidelines, sincerity in implementation, and a broader, integrated approach. HFE, by virtue of its human-centred focus, is well-positioned to lead efforts toward gender equity in engineering, but concerted effort is required.

KEYWORDS

Human factors and ergonomics education; gender equity; engineering education

Introduction

Engineering fields suffer from stark gender imbalances, with women comprising only 31% of science, technology, engineering, and maths (STEM) university students in the UK (HESA, 2023). Although the 'men are technical and women are social' dichotomy is a socially constructed and structurally perpetuated fallacy, it nevertheless holds true that incorporating more human-centric perspectives into engineering education could attract a more women into the domain (Faulkner, 2007; Nilsson, 2015). Human factors and ergonomics (HFE) as a sub-discipline that is concerned with designing systems for human use, inherently integrates social and technical elements. It could therefore play a key role in fostering gender equity in engineering; however, little research has addressed HFE's educational potential in this context.

Gender mainstreaming in education, which embeds gender considerations across curricula, has been identified as a strategy to address disparities (Peña & de les Valls, 2023); however, there is resistance to this approach (Verge et al., 2018). Incorporating more HFE content into engineering education could circumvent resistance and contribute to greater gender equity. It would also contribute to better engineers (Boiron et al., 2022). This research seeks to explore these issues, asking: to what extent are requirements for gender mainstreaming in engineering met in HFE education specifically, what is the status quo, and to what extent does HFE represent a suitable vehicle for greater incorporation of the gender perspective into engineering education?

Method

The study combined surveys and semi-structured interviews. The questionnaire included openended questions asking participants' opinions on the extent to which gender is incorporated into engineering and HFE education. It also included a question on participants' views of the humanisation of engineering as a route to gender equity, and the role that HFE education could play therein. Respondents were also asked about the extent to which 24 specific aspects of gender mainstreaming were already incorporated into engineering and human factors education, with responses invited on a six-point Likert scale from 'Not at all' to 'Completely' (adapted from Peña et al., 2021). The follow-up interviews provided deeper context, further insight into experiences, and details on institutional support for gender-focused teaching. The study was approved by the University of Southampton ethics committee (ID 89859).

Results

Questionnaire: Participants

A total of 21 individuals provided sufficiently complete responses to the questionnaire, 17 of whom were female, three of whom were male, one of whom self-described as gender fluid. One male did not provide his age, the others were between 23 and 81 years of age. The females' ages ranged from 22 to 63 (mean = 35.5, SD = 11.4), and the gender fluid individual was 21. Ten respondents gained their experience in the UK, four in Australia, two in the US, and one in Canada. Four did not indicate where they had gained their HFE experience. Results regarding the respondents' level of experience and the recency of that experience are presented in Figures 1 and 2.



Figure 1. Respondents' level or types of HF experience



Figure 2. Recency of respondents' experience

Questionnaire: quantitative findings

Figure 3, below, shows the distribution of responses to the two questions asking respondents about the extent to which they thought gender was incorporated into engineering education and into HFE education, on a scale of one (not at all incorporated) to 10 (completely incorporated). Taken as a group, the respondents were more positive about the extent to which gender was included in HFE education compared to engineering more broadly.



Figure 3. Distribution of responses to the questions "To what extent do you think the sex and gender perspective is incorporated into current engineering / human factors and ergonomics teaching at your institution?"

Table 1, below, displays all items of the section of the questionnaire taken from (Peña et al., 2021) on the methods by which gender could or should be incorporated into education. Responses to the question "In your experience of human factors and ergonomics education, to what extent are the following aspects incorporated into or included in teaching at your institution?" were invited on a six-point scale from not at all (one) to completely (six). Table 1 provides the means, standard deviations, and ranges of responses to each item.

Finally, Figure 4 displays the distribution of responses to the question "If you have responded to this questionnaire as an educator, do you feel ready, sufficiently equipped, and/or supported internally or externally to start incorporating the gender perspective into your teaching and/or module/course design activities?". Note that this question was only presented to those that had indicated being an educator, not only a student, of HFE. As can be seen, none of the 11 individuals answering this question said that they already fully incorporated the gender perspective into their teaching. One said that they did not see the need to.



Figure 4. Distribution of responses to the item asking educators the extent to which they felt ready, sufficiently equipped, and/or supported internally or externally to start incorporating the gender perspective into their teaching activities (n = 11).

Table 1. Mean responses to the items taken from (Peña et al., 2021) on the ways in which gender can be incorporated into education, recorded on a scale from one (not incorporated at all) to six (completely incorporated).

Item	Mean	SD	Range
Explaining the usefulness of the gender perspective	3.2	1.4	1-6
Explaining the social relevance of the gender perspective	2.9	1.5	1-5
Including references of female authors and/or professional women	3.8	1.7	1-6
Including the full first names of authors referenced	3.1	1.9	1-6
Ensuring images used in teaching do not perpetuate gender stereotypes	3.6	1.7	1-6
Ensuring the use of non-sexist and non-androcentric language in teaching materials	4.0	1.6	1-6
Using examples in class that challenge or counter gender stereotypes	3.2	1.7	1-6
Ensuring examples and exercises cover various topics	4.5	1.3	1-6
Allowing students to participate in defining some of the content	3.8	1.6	1-6
Ensuring learning is active, combining participatory activities, case studies, projects, etc.	5.1	1.2	3-6
Promote the study of an issue that has social and/or gender relevance	3.5	1.7	1-6
Highlighting where a woman plays a relevant role in a case study	3.0	1.7	1-6
Including at least one lecture or video delivered by a woman	4.4	1.5	1-6
Explicitly highlighting social and/or gender relevance in teaching activities	2.9	1.5	1-6
Giving guidelines on inclusive language for presentations and/or reports	2.8	1.4	1-6
Holding in-class discussions on aspects related to the gender perspective	2.5	1.5	1-6
Analysing potential gender imbalance in in-class participation	2.7	1.4	1-5
Protecting female participation from (male) interruption	3.1	1.7	1-6
Ensuring students' responses are treated with respect and tolerance	5.2	.83	3-6
Ensuring students use non-sexist, inclusive language in class	4.5	1.3	1-6
Analysing the distribution of roles in group work and discuss in class	3.3	1.6	1-6
Promoting rotating roles in group work	3.5	1.8	1-6
Empowering females in work groups by ensuring they are addressed, listened to, etc.	3.2	1.5	1-6
Ensuring the educator is accessible outside of class hours to address student queries / concerns	4.9	1.2	2-6

Questionnaire: Qualitative results

Free text responses were provided to three questions. The first concerned the gender perspective in engineering education, asking: "If you think it is not sufficiently or completely incorporated, or that more could be done, what else do you think could be included or done? Why, or in what way? If you think it is sufficiently incorporated, could you give examples of how it is currently done (e.g., best practices), or why you think further inclusion unnecessary (if that is your view)?" The second question was worded in the same way but asked about HFE education rather than engineering education. The third question asked about the humanisation of engineering, stating: "Greater humanisation of engineering education (science, technology, engineering, maths) (e.g., see: https://doi.org/10.1007/s10668-023-03667-2). Considering this, how do you see the role of human factors and ergonomics in contributing to gender equity in broader engineering education and beyond (e.g., in the workplace or research domain)?".

Gender in engineering education

Respondents provided a total of 622 words in response to this question, across 14 responses (with an average of 44.4 words per response, and a range of 12 to 99 words). Three individuals referred to a lack of attention paid to gender in engineering education or the acknowledgement that it is or should be an issue of importance (e.g., *"It's not mentioned and rarely acknowledged as a significant*").

factor" female, 43). Where respondents discussed its inclusion, this was typically in relation to HFE teaching (or a related topic), with some discussion of physical ergonomics or anthropometrics as the main topic via which sex and/or gender is covered (e.g., "*If it does happen to be mentioned, it is usually associated with anthropometrics*" female, 32); however, caveats were often provided (e.g., "*In terms of gender equity, the teaching has some inclusion of human centred design but I wouldn't say there is explicit teaching on gender perspectives*", female, 42).

Interestingly, and in advance of a question a related question that appeared later in the questionnaire, one respondent indicated that "*Human factors and ergonomics is typically not sufficiently incorporated into engineering teaching within my discipline*" (female, 32), and another discussed a lack of support from their faculty: "*I haven't overtly included a sex or gender perspective in my teaching and haven't had guidance from my institution to do so*" (female, 39).

Several respondents discussed aspects that went beyond the content of teaching, including the presence of female staff and the impact of having a woman in an influential faculty position (e.g., *"We have the first female dean and she is very worried about promoting women in science"*, female, 41) and the consideration for learning and interaction styles in class activities (*"It is mostly ignored especially in modules that require group work who just ignore the way that gender can influence that experience"*, female, 22).

Gender in HFE education

Respondents provided a total of 415 words in response to this question, across 9 responses (with an average of 51.9 words per response, and a range of 12 to 104 words). Fewer responses were provided to this question, perhaps in part due to its similarity to the previous question and the finding that several people discussed HFE teaching when asked about engineering (and may not have felt the need to repeat themselves). Of the nine respondents that provided responses to this item, five expressed what could be considered as negative sentiments, e.g., *"It's not mentioned at all that perspectives could be different or varied"* (female, 43).

Two respondents were more positive, discussing how the issue is currently incorporated into the teaching of which they had experience: "In the HF/E course there is acknowledgment of HCD [human centred design] to accommodate for diversity" (female, 42). Another respondent discussed more generally how gender is inherent to the HFE approach: "In my opinion, human factors provides knowledge and tools to work with human variability. This includes sex, age, disabilities, etc. This perspective is always present." (female, 41).

How do you see the role of HFE in contributing to gender equity?

Respondents provided a total of 626 words in response to this question, across 13 responses (with an average of 48.1 words per response, and a range of 8 to 110 words). Many of the responses to this question centred on HF being a potential leader in the strive for greater gender equity in engineering: e.g., "*I think HFE has a vital role to play* ... given its underpinning humanistic and participatory roots" female, 41. Some expressed sentiments more related to the content of teaching (e.g., "*It certainly highlights how different genders interact with engineering in different ways*" female, 24), whereas others referred more to other contributions that could be made (e.g., "*By studying HFE and talking about the issues that occur groups may feel less ignored or marginalised which in turn increases engagement in the engineering disciplines as a whole*" female, 22).

One respondent made a point about the relevance of HFE, the greater proportion of women in the field compared to other engineering disciplines, and the potential impact on gender equity in broader engineering: "I know that there is a higher proportion of women in HFE compared to other engineering disciplines and STEM fields more broadly. I think that HFE will continue to grow in relevance... This may make women in STEM more visible in companies" (female, 24). That said, a

warning from another respondent highlighted the importance of the ways in which HFE teaching is incorporated: "Educators must understand WHY there is a need for this, so students can be convinced that this is not just a fashionable thing to do or a box-ticking exercise" (female, 39). Another respondent commented on the difficulty that could be faced in such an exercise: "It's hard enough even getting the HF 'voice' adequately respected in engineering (and this is from someone who is a HF lecturer and is also a woman engineer), let alone gender perspectives" (female, 42).

In contrast to these positive comments, one respondent indicated disagreement with the need to emphasise the gender perspective, stating: "*I personally disagree with highlighting gender issues over others, such as aging or disability, which are also very relevant*" (female, 41). This should be considered alongside the warning that implementation requires careful thought.

Finally, although the current research specifically focussed on teaching rather than research (which has begun to be addressed elsewhere: Parnell & Plant, 2024; Parnell et al., 2022; Read et al., 2022), one respondent mentioned its importance for education: *"although this survey is focussed on education not research it is important to support gender equity in research so that there are good opportunities to cite women scholars in teaching materials on key HFE topics"* (female, 41).

Interviews

Five survey respondents indicated being interested in participating in a follow-up interview by providing their email address at the end of the questionnaire. Three of those responded to emails and were interviewed, all of whom were women. Two were from the same institution, one of whom was a 33-year-old PhD student with seven years of experience in maritime engineering, the other a 37-year-old associate professor with 15 years of experience in human factors. The third was a 39-year-old assistant professor with 20 years of experience in human factors, user interface design, and human-computer interaction. The latter two had received and delivered HFE teaching at the university level, the PhD student had taken a module in HFE as part of her undergraduate education and was incorporating HFE into her PhD. All came from institutions in which HFE teaching is embedded in an engineering faculty. Each interview lasted approximately 30 minutes.

Each interviewee was asked whether they considered gender to be relevant in engineering education and to what extent it was already covered. The assistant professor indicated that *"it is not really talked about"*, though went on to describe an example where a PhD student of hers had been *"mansplained by one of the lecturers who thought he was doing the right thing"* when being shown examples of female engineers that students should be aspiring to. Considering the inclusion of the items 'Including references of female authors and/or professional women' and 'Highlighting where a woman plays a relevant role in a case study' in the guidelines provided by (Peña et al., 2021) (in Table 1), this highlights a danger, with the method of implementation (alongside sincerity) crucial if resistance is to be avoided.

The associate professor noted a top-down, imposed need to include equity considerations in teaching, commenting that it "feels like there's a bit of reverse engineering going on". She was, however, largely positive, intimating that "in the last couple of years, it's become much more considered". The PhD student was also positive ("as time has passed, it's becoming more prevalent in engineering education"); however, she noted that the education system is "still not considering equity in and of itself and it's not considering gender specifically". When asked specifically about HFE education, all three stated that gender is already incorporated. The associate professor referred to demographics in human-based research, the assistant professor discussed representative data, and the PhD student discussed how gender "is fundamental to human factors".

The two educators were asked if they had received guidance on incorporating gender into teaching, or why this might be useful, to which both answered no. Where they had incorporated the topic,

they discussed personal rather than institutional motivations. For example, the associate professor discussed her experiences of becoming a mother (*"I didn't really ever think it was a big issue until I had children and then I really could see…no one's ever told me or taught me about it"*).

To explore how the interviewees thought gender might be better integrated, the questionnaire prompts displayed in Table 1 (above) were shared on screen and discussed. Both the PhD student and the associate professor discussed gender-neutral language as a key issue, e.g., "I do a lot in, like unmanned aerial vehicles, like UAVs, and I always say crewed, un-crewed, to you know, very senior professors. It's just a natural 'unmanned' and I always say un-crewed'' (associate professor). The most salient message, however, was that there is currently no top-down support for educators.

The interviewees were asked which they thought would be more suitable, a transversal approach whereby gender is incorporated into all aspects of engineering education, or a focussed approach whereby it is provided as part of a specific subject (as discussed by González-González et al., 2020). The associate professor articulated the view that a transversal approach would be more suitable: *"I think it's that classic like little and often, if you just have it in one module, people might switch off more easily or think oh, it's not really relevant to me"*. The PhD student went further to state *"I would lean towards a transversal approach for integrating human factors education into engineering as a whole as well"*, suggesting that incorporating human factors across engineering modules represents a means for incorporating gender, and other social aspects, into engineering.

Discussion

This pilot study has sought to present some initial discussions around gender in human factors and ergonomics (HFE) education and of the role of HFE in the socialisation and gender equitisation of engineering education at the tertiary level. In terms of the specific tools and methods by which engineering gender inequity might be addressed (Peña et al., 2021) (see Table 1), results paint a mixed picture. Active and participatory learning activities, ensuring the educator is available outside of class hours, and respecting students' in-class responses are all well implemented. These are markers for high quality, engaging teaching in a general sense. In contrast, gender specific factors such as analysing in-class gender imbalances, holding discussions related to gender, and highlighting the social relevance of gender, are not well implemented. This implies a wellestablished approach to engaging, respectful teaching, but a lack of directed attention to gender. One might suggest Advance HE's Athena Swan framework (Advance HE, n.d.-a) to go some way to address this; however, the practical benefit and sincerity of Athen Swan implementation was questioned by the associate professor interviewee: "I just found it all a bit tick, boxy. At the moment, there's so much, you know, Athena Swan this and that, and it's ... hard to stomach sometimes". This is still clearly a challenge, with performative policies a major barrier to true equality in higher education (Smidt et al., 2021).

The results suggest that the gender gap in STEM is not being sufficiently addressed. Although participants were more positive about HFE compared to wider engineering, most did not consider the issue of gender to be sufficiently addressed in either. Where it is considered, many spoke of a superficial treatment majoring on anthropometrics. Furthermore, recognition of shortcomings in data and physical systems is key (e.g., Criado Perez, 2019), but insufficient.

Despite the existence of guidelines that mandate the inclusion of equity issues in engineering (Engineering Council, 2020), none of the participants of this research was wholly satisfied with how it is currently covered. Although HFE sees a more equal gender balance than most engineering subdisciplines (Lum et al., 2022), and respondents were somewhat more positive about HFE compared to engineering more broadly, more could certainly be done. For example, results suggest there to be little institutional support for direct treatment of gender by university educators, despite a relatively long history of effort in this domain (e.g., Cronin & Roger, 1999). Incorporating the factors outlined by Peña et al. (2021) into training programmes targeted at early career lecturers, for example through Advance HE's widely adopted fellowship programme (Advance HE, n.d.-b), could represent a suitable initial avenue for this. That said, this may not go far enough: "*I think PGCAP* [post-graduate certificate in academic practice] *will capture a certain demographic of ... newer younger academics... If it's going to be done properly, there needs to be some kind of best practise guidance*" (associate professor).

The participants, particularly the interviewees, suggested HFE to represent an ideal vehicle for the greater incorporation of the social relevance aspect into engineering. The perceived societal relevance of engineering is one of the most crucial factors for increasing women's participation in the field (Baker et al., 2007), and acknowledging the societal relevance of engineering concepts has been highlighted as necessary for enhancing and sustaining young women's motivation to pursue engineering (Godwin et al., 2016). This needs to be capitalised on by the HFE community. There was broad agreement that a transversal approach, whereby issues are integrated across subjects and modules, rather than a focussed approach, in which gender is focussed upon in a single subject or module, is required. This is already happening in engineering education in relation to the UN's sustainable development goals (SDG) (Pérez-Foguet & Lazzarini, 2019). Notably, one of those goals is gender equality (United Nations, n.d.), yet there remains a long-standing resistance to gender mainstreaming in education (Acker, 1988; Tildesley, 2023; Verge et al., 2018). Therefore, taking a transversal approach to integrating HFE material across engineering sub-disciplines, and including gender as a core topic within that integration, could present a way to embed this SDG whilst overcoming some of the observed resistance; however, such change would need to be driven by the institution rather than by individual educators (Peterson & Jordansson, 2022). Moreover, although this would contribute to greater focus on the social benefit of engineering and provide a stronger end user perspective in teaching content, it would not necessarily address the teaching style factors outlined by Peña and colleagues (Peña & de les Valls, 2023; Peña et al., 2021). These would still apply to any higher education teaching activities, in HFE or other engineering sub-disciplines, or indeed any other subject within and beyond the STEM field.

Limitations

Given the small sample sizes, results must be treated with caution. This was a pilot study to support initial explorations in the field of gender, human factors, and engineering, hence is not positioned as a full exploration of themes. Much more attention in this field is required, with engagement from participants from a broader range of institutions and greater international representation required to provide more detailed and robust answers to the research question posed above. It is also important to highlight the gender imbalance in the sample, with most questionnaire respondents and all interviewees being women. The path to societal gender equity cannot only involve women (Kimmel, 2005). This is true broadly as well as specifically in the context of engineering (Wilson et al., 2021). Greater male participation in this kind of research is therefore crucial.

The qualitative nature of this research requires recognition of the biases of the analyst. I am a white, cis-gender, male researcher attempting to approach the issue as an ally, from a belief that a more gender equitable society will benefit all genders. Had this research been undertaken by a woman, or someone that does not conform to the binary male/female distinction, different insights (and indeed different data, particularly interview data) would likely have resulted. Although this does not diminish the utility of this study, it does merit explicit acknowledgement.

Conclusions

This discussion piece and pilot study has explored the potential for greater integration of HFE into engineering education at the university level to help address the long-standing and persistent gender imbalance seen in STEM. Emphasising the societal relevance of engineering has been

acknowledged as a way to encourage more women into the field. HFE, as an engineering subdiscipline, addresses this point, hence offers a natural vehicle for gender-focussed teaching strategies and content. That said, care must be taken with implementation to avoid resistance, and educators must have guidance to draw on.

References

- Acker, S. (1988). Teachers, gender and resistance. *British journal of sociology of education*, 9(3), 307-322.
- Advance HE. (n.d.-a). *Athena Swan Charter*. Retrieved 03/07/2024 from <u>https://www.advance-he.ac.uk/equality-charters/athena-swan-charter</u>
- Advance HE. (n.d.-b). *Fellowship*. Retrieved 04/07/2024 from <u>https://www.advance-he.ac.uk/fellowship/fellowship</u>
- Baker, D., Krause, S., Yaşar, Ş., Roberts, C., & Robinson-Kurpius, S. (2007). An intervention to address gender issues in a course on design, engineering, and technology for science educators. *Journal of engineering education*, 96(3), 213-226.
- Boiron, O., Deumié, C., Raviol, L., & Benech-Kopelianskis, M. (2022). Incorporating the Gender Perspective in Engineering Curricula: The Case of École Centrale Marseille. In Overcoming the Challenge of Structural Change in Research Organisations–A Reflexive Approach to Gender Equality (pp. 143-157). Emerald Publishing Limited.
- Criado Perez, C. (2019). Invisible women: Data bias in a world designed for men. Abrams.
- Cronin, C., & Roger, A. (1999). Theorizing progress: Women in science, engineering, and technology in higher education. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, *36*(6), 637-661.
- Engineering Council. (2020). The Accreditation of Higher Education Programmes (AHEP) Fourth Edition.
- Faulkner, W. (2007). 'Nuts and Bolts and People':Gender-Troubled Engineering Identities. Social Studies of Science, 37(3), 331-356. <u>https://doi.org/10.1177/0306312706072175</u>
- Godwin, A., Potvin, G., Hazari, Z., & Lock, R. (2016). Identity, critical agency, and engineering: An affective model for predicting engineering as a career choice. *Journal of engineering education*, 105(2), 312-340.
- González-González, C. S., García-Holgado, A., & Garcia-Peñalvo, F. J. (2020, 27-30 April 2020). Strategies to introduce gender perspective in Engineering studies: a proposal based on selfdiagnosis. 2020 IEEE Global Engineering Education Conference (EDUCON),
- HESA. (2023). What do HE students study? Retrieved 13/05/2024 from https://www.hesa.ac.uk/data-and-analysis/students/what-study#complete
- Kimmel, M. S. (2005). Why men should support gender equity. Women's Studies, 103, 102-114.
- Lum, H. C., Grier, R., Waldfogle, G., Hancock, G. M., Lerner Papautsky, E., & Hughes, A. M. (2022). Reflections on Gender Bias and Disparity in the HF/E Profession. Proceedings of the Human Factors and Ergonomics Society Annual Meeting,
- Nilsson, L. (2015, 27th of April, 2015). How to attract female engineers. The New York Times.
- Parnell, K. J., & Plant, K. L. (2024). How can human factors close the gender data gap? *Human Factors and Ergonomics in Manufacturing & Service Industries*, *34*(1), 63-75.
- Parnell, K. J., Pope, K. A., Hart, S., Sturgess, E., Hayward, R., Leonard, P., & Madeira-Revell, K. (2022). 'It's a man's world': a gender-equitable scoping review of gender, transportation, and work. *Ergonomics*, 65(11), 1537-1553. <u>https://doi.org/10.1080/00140139.2022.2070662</u>
- Peña, M., & de les Valls, E. M. (2023). Inclusion of the gender equality sustainable development goal in engineering teaching and research. *Environment, Development and Sustainability*. <u>https://doi.org/10.1007/s10668-023-03667-2</u>

- Peña, M., Olmedo-Torre, N., Mas de les Valls, E., & Lusa, A. (2021). Introducing and Evaluating the Effective Inclusion of Gender Dimension in STEM Higher Education. *Sustainability*, 13(9), 4994. <u>https://www.mdpi.com/2071-1050/13/9/4994</u>
- Pérez-Foguet, A., & Lazzarini, B. (2019). Continuing professional education in engineering faculties: Transversal integration of sustainable human development in basic engineering sciences courses. *Journal of Cleaner Production*, 218, 772-781. <u>https://doi.org/https://doi.org/10.1016/j.jclepro.2019.02.054</u>
- Peterson, H., & Jordansson, B. (2022). Gender mainstreaming in Swedish academia: translating policy into practice. *Journal of Gender Studies*, *31*(1), 87-100.
- Read, G., Madeira-Revell, K., Parnell, K., Lockton, D., & Salmon, P. (2022). Using human factors and ergonomics methods to challenge the status quo: Designing for gender equitable research outcomes. *Applied ergonomics*, *99*, 103634.
- Smidt, T. B., Pétursdóttir, G. M., & Einarsdóttir, Þ. (2021). When discourse is hijacked: An implicit and performative resistance strategy to gender equality in higher education. *Journal of Women* and Gender in Higher Education, 14(2), 143-165.
- Tildesley, R. (2023). Transforming academic research? Resistances to gender mainstreaming implementation in universities. *European Journal of Women's Studies*, *30*(4), 486-501.
- United Nations. (n.d.). *Goal 5: Achieve gender equality and empower all women and girls*. Retrieved 04/07/2024 from <u>https://www.un.org/sustainabledevelopment/gender-equality/</u>
- Verge, T., Ferrer-Fons, M., & González, M. J. (2018). Resistance to mainstreaming gender into the higher education curriculum. *European Journal of Women's Studies*, 25(1), 86-101.
- Wilson, N. L., Dance, T., Pei, W., Sanders, R. S., & Ulrich, A. C. (2021). Learning, experiences, and actions towards advancing gender equity in engineering as aspiring men's allyship group. *The Canadian Journal of Chemical Engineering*, 99(10), 2124-2137.