

SUPPORT GUIDE FOR INTEGRATING THE GENDER PERSPECTIVE

IN NATURAL SCIENCES TEACHING PRACTICE



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THE IMPORTANCE OF INTEGRATING GENDER IN NATURAL SCIENCES

The absence of a gender perspective has historically influenced the way in which the experimental sciences have developed, shaping not only the selection of problems but also the formulation of research questions and the interpretation of data. This influence is reflected in the way empirical studies are designed and conducted, as **the variable of sex is not always systematically incorporated into scientific research**. As a result, the validity and generalisability of the results are compromised (Miller et al., 2017), as demonstrated by recent work in the field of ecology, which has highlighted the importance of this dimension for properly understanding interactions between species and the functioning of ecosystems (Gissi et al., 2024). The social dimension also requires special attention in this case, given that **clear differences in environmental attitudes are observed between women and men**; consequently, only a gender-sensitive analysis enables us to understand social and ecological phenomena in a comprehensive manner (Echavarren, 2023).

In Biology, for example, research has for decades shown a tendency to prioritise male subjects in physiological, biomedical and pharmacological studies, resulting in gaps in knowledge that have had detrimental clinical repercussions for women. Literature reviews have shown that, **even when differences between women and men are known, many studies do not include sufficient female participants or do not analyse the results by sex**, which limits the generalisability of the conclusions to entire populations (Woitowich et al., 2020). This situation is particularly alarming given the extensive evidence showing that biological responses can differ significantly between the sexes, for example in the pharmacokinetics of medicines, in susceptibility to autoimmune diseases, or in the expression of certain physiological traits (McClements et al., 2025). It is therefore necessary to rethink experimental design so that samples adequately represent both sexes, and for data to be analysed whilst taking this variable into account.

Similarly, in the field of chemistry, an apparent neutrality has traditionally been maintained which, in practice, has obscured the influence of biological and social variables on chemical processes applied to health, the environment, or industry. In fields such as toxicology and pharmaceutical chemistry, **it has been demonstrated that exposure to certain substances can produce sex-specific effects due to hormonal, metabolic, and physiological variations** (Beery and Zucker, 2011; Zucker and Beery, 2010). However, these factors are not always incorporated into experimental designs or risk assessments, leading to incomplete conclusions and the application of models that are poorly suited to the diversity of the population.

Scientific literature has also shown that **the impacts of environmental problems are not distributed evenly, but are influenced by social, economic, and gender factors**. Women, especially in rural contexts or in countries with higher levels of inequality, often play a central role in managing natural resources such as water, household energy, and food, which places them in positions of greater vulnerability to phenomena such as climate change and environmental degradation. At the same time, these responsibilities give them specific knowledge of the environment that is often not recognized in environmental decision-making processes (Ayuda en Acción, 2024). Thus, environmental sciences stand as a field particularly well-suited to integrating gender analysis when studying the relationship between natural systems and human societies.

Integrating a gender perspective in this field is not only enriching but also necessary for understanding how **biological, chemical, and environmental phenomena can have different impacts depending on sex and gender, as well as for explicitly incorporating women's realities and experiences**. Otherwise, the needs, knowledge, and living conditions of half the population are sidelined, which limits the effectiveness of responses to the problems addressed. To facilitate the inclusion of this content, specific strategies for the various degree programmes offered by the UJA are set out below, along with recommended reading for each programme.

SPECIFIC STRATEGIES

BIOLOGY

- Disaggregate results by sex in all research that includes relevant biological variables.
- Include sex/gender studies in core texts and case studies, highlighting how these variables influence biological processes.
- Design laboratory exercises that analyze functional variations between the sexes in biological models (e.g., physiological responses).
- Promote specific seminars and modules on bioethics and gender, including discussions on experimentation and representativeness.
- Introduce an explicit criterion in the evaluation rubrics for lab work and projects that refers to the quality of the sex/gender analysis.

CHEMISTRY

- Analyze case studies and examples in organic, inorganic, or analytical chemistry, selecting problems that incorporate gender differences where relevant (e.g., differential toxicity, occupational exposure).
- Include modules on chemical risks and gender, assessing how certain substances may have different effects on women and men based on toxicological or public health evidence.
- Redesign laboratory practices with a critical approach, encouraging students to consider not only the instrumental results but also the social implications of their application.
- Integrate studies on safety and working conditions that analyze how work schedules, roles, and exposures may differ by gender in industrial and research contexts.

ENVIROMENTAL SCIENCES

- Include case studies that analyze the distribution of environmental benefits and burdens by gender (for example: access to water, the effects of pollution on women versus men).
- Promote field projects with a gender focus, in which students collect and analyze information that takes social and environmental inequalities into account.
- Incorporate interdisciplinary analysis with the social sciences to understand how cultural practices influence interaction with the natural environment.
- Develop seminars on environmental policy and equity, addressing how regulatory frameworks can have unequal impacts based on gender.
- Link course content to sustainable development (SDG 5 and SDG 13) and the intersections between environmental justice and gender justice.

RECOMMENDED UJA BIBLIOGRAPHY

BIOLOGY AND CHEMISTRY

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