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BBC: Breaking Boundaries in K-12 Classrooms: Fostering Gender Inclusion in STEM Teaching

Embedding gender in daily teaching Workshop 2

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Workshop Structure

- Welcome and introduction
- Memory association test
- Introduction to the topic and objectives
- Where is discrimination present?
- Solution approaches



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Before we start: Let's play!



<https://mat-kwvhjz2sq-alessio-leoncinis-projects.vercel.app/>



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Memory Association Test – Results

Memory Association Test – Results

- How did it go?
- How do you feel about the results?
- Did you notice unconscious biases?





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Main Objectives

*Develop knowledge on
how to create an
inclusive, gender-oriented
environment in STEM
subjects*

*Promote efficiency by
identifying topics that
facilitate gender
integration and reduce
stereotypes*

*Find examples that can be
used to promote inclusivity
in teaching and education*



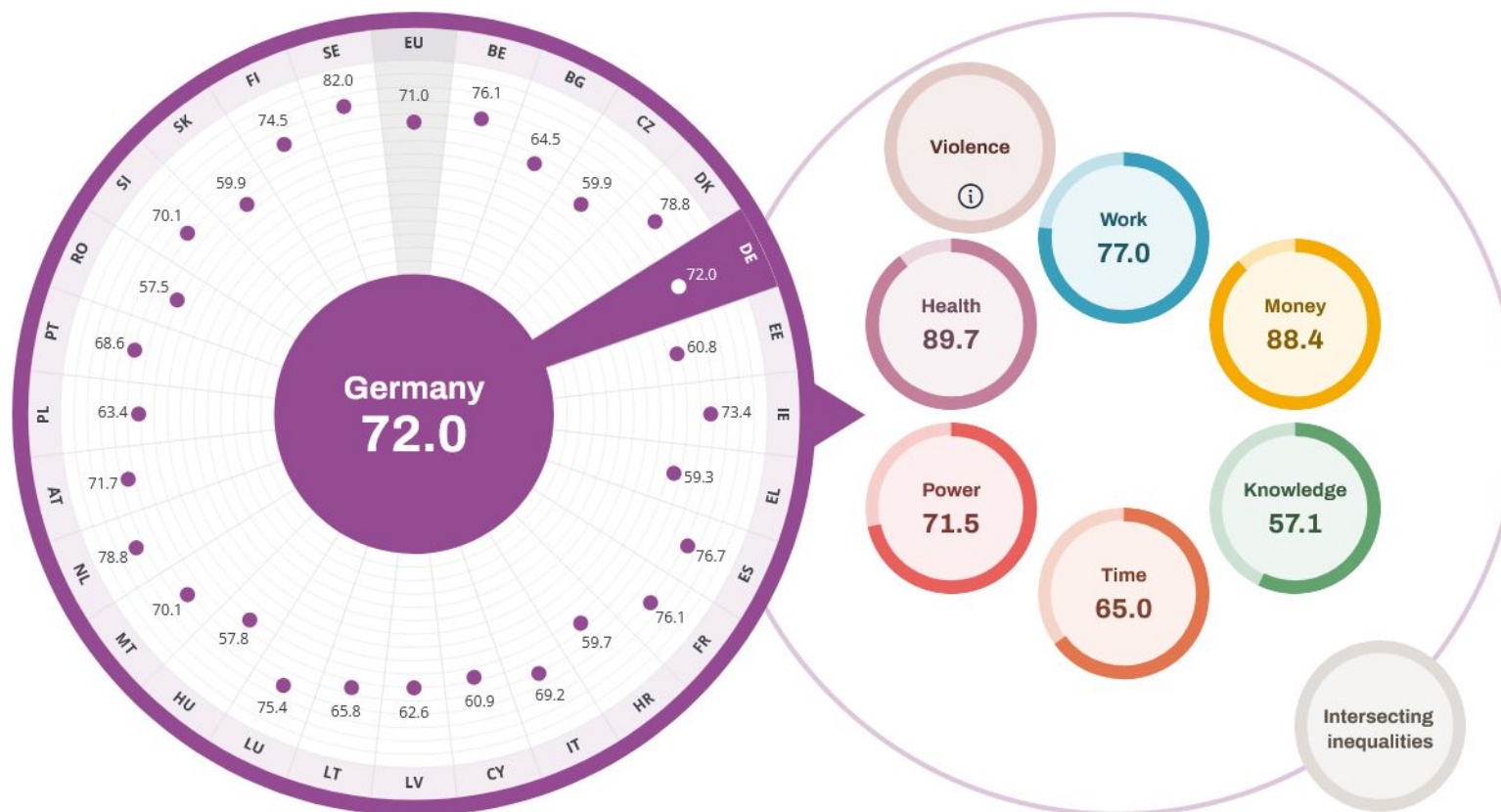
Different Levels of Implementation

- **Macro level:** Plans/policies for gender equality; intersectionality and diversity → responsibility: school leadership
- **Micro level:** Gender topics in everyday teaching → responsibility: teachers



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Gender Equality Index





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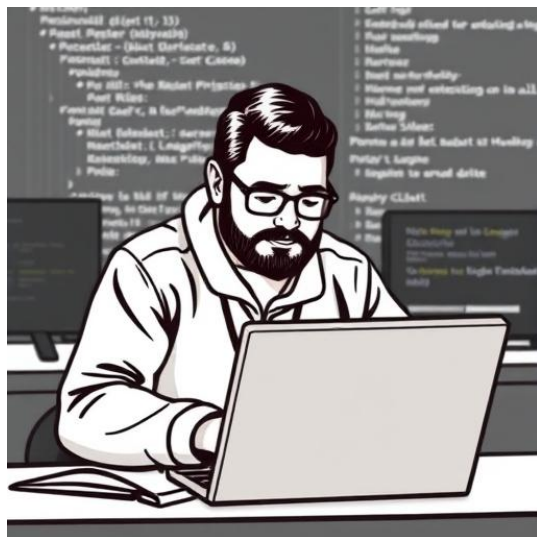
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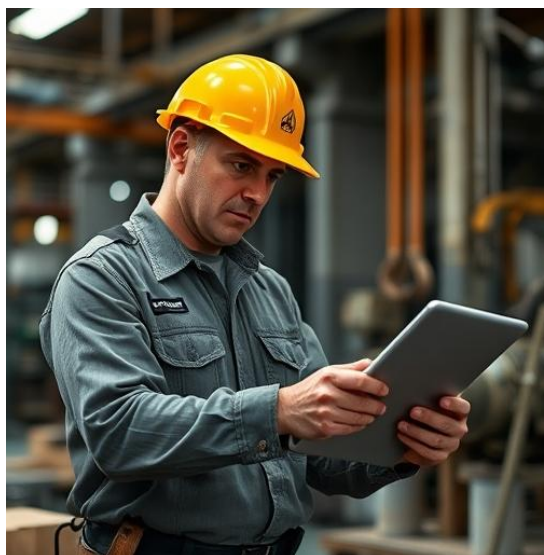
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Stereotype

„Programmer“



Quelle: deepai.org



Quelle: deepai.org

„Engineer“

„Baker“



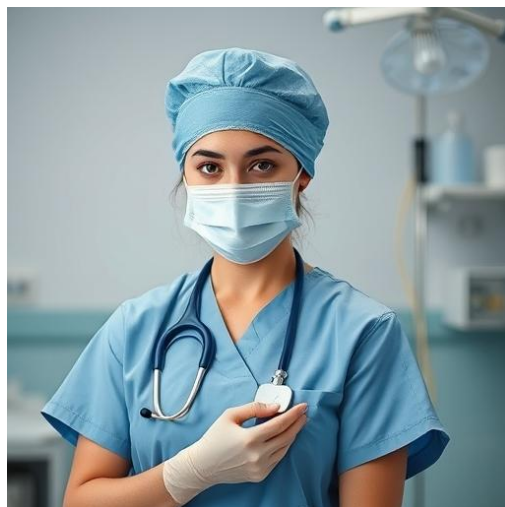
Quelle: deepai.org



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Stereotype

„Nurse“



Quelle: deepai.org



Quelle: deepai.org

„Secretary“

„Hairdresser“



Quelle: deepai.org



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Stereotype

- Widespread in society
- → Can reduce perceived competence
- → Internalization leads to anxiety about fulfilling them
- → Need for active counteraction
- → Teachers = key actors



Quelle: deepai.org



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Paradox 2018

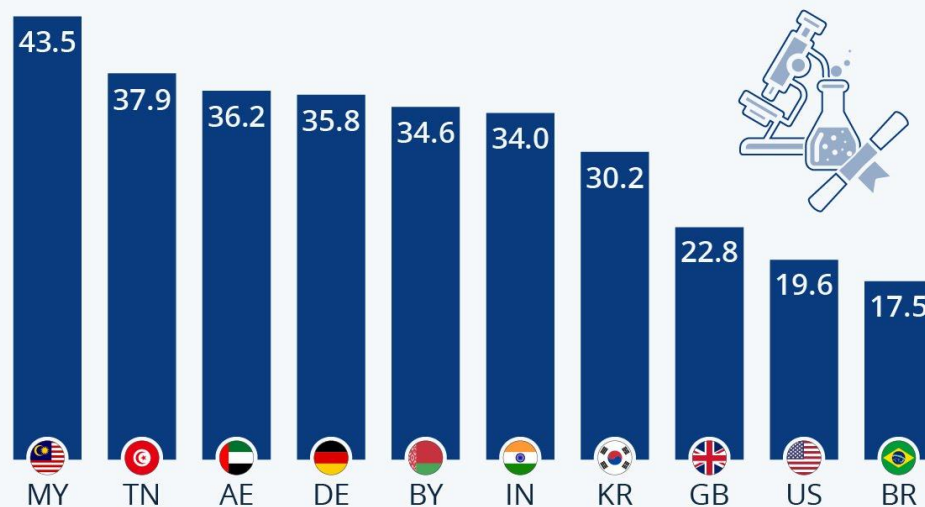
- In countries with lower Gender Gap Index, gap between girls and boys in STEM education is smaller
- In wealthier countries: career choice feels safer → women often choose based on non-economic factors
- In poorer countries: STEM seen as stable, well-paid → more attractive for women



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Where Students Choose STEM Degrees

STEM graduates as a share of all tertiary education degree recipients in selected countries in 2022 (in percent)*



* or latest available. No data published for China

Source: UNESCO Institute for Statistics





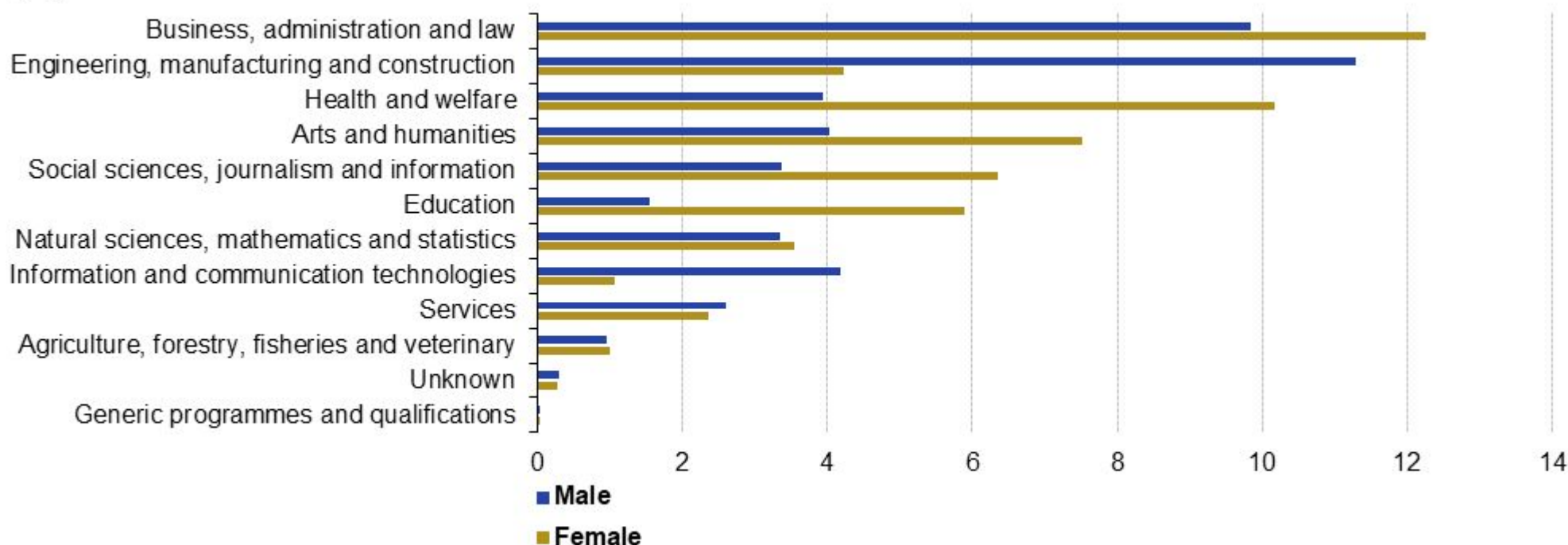
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Distribution of tertiary education students by broad field and sex, EU, 2022 (%)

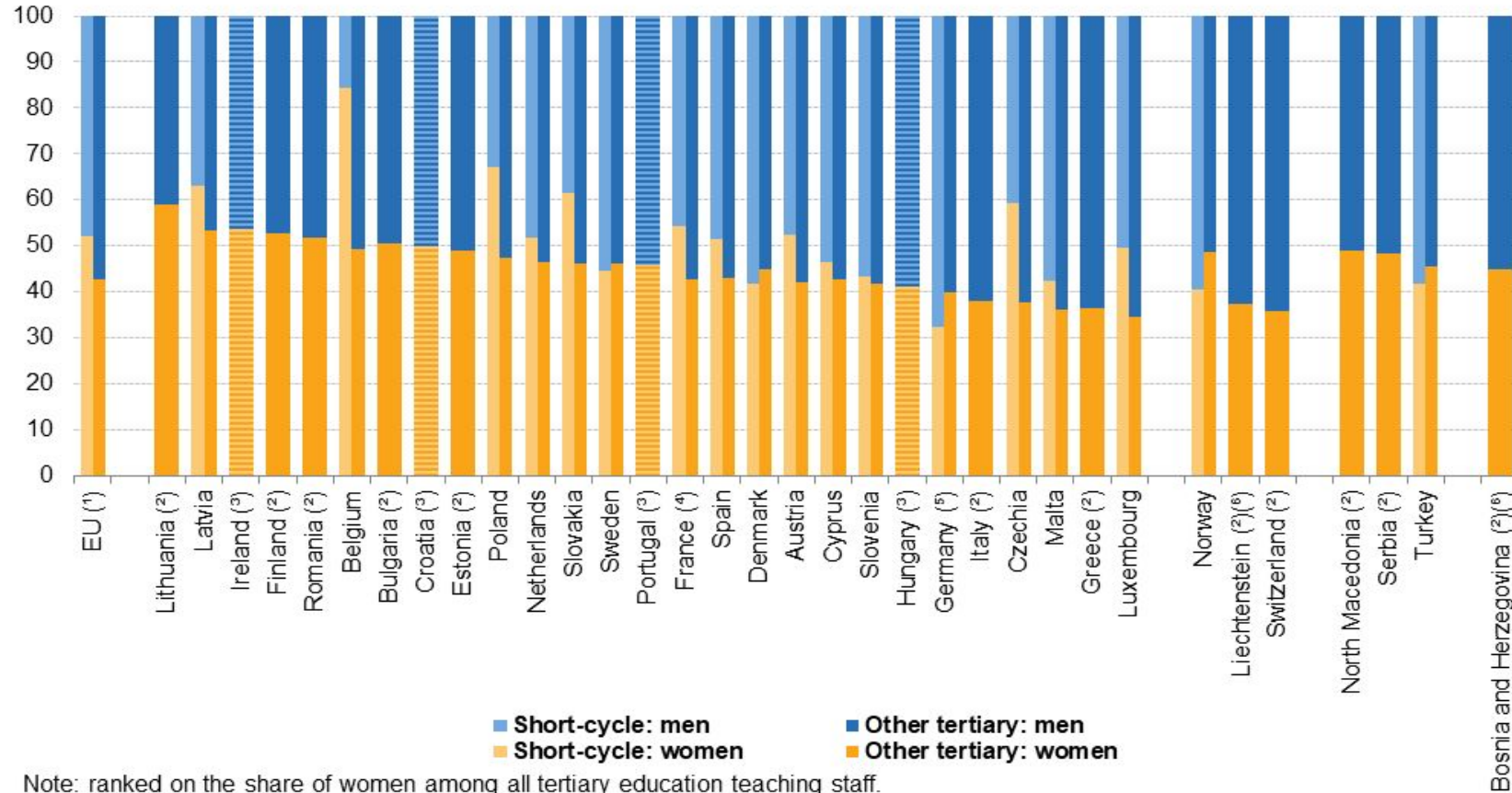


Note: ranked on the total (male and female) share of students in each broad field. Excluding the Netherlands.

Source: Eurostat (online data code: educ_uoe_enrt03)

Teaching staff in tertiary education by sex and level of education, 2020

(%)



Note: ranked on the share of women among all tertiary education teaching staff.

(1) Excluding Ireland, Croatia, Hungary and Portugal. Excluding private institutions in France.

(2) Short-cycle tertiary: not applicable.

(3) Data only available for all tertiary education levels combined.

(4) Excluding private institutions.

(5) Estimate.

(6) 2019.

Source: Eurostat (online data code: educ_uae_perp01)





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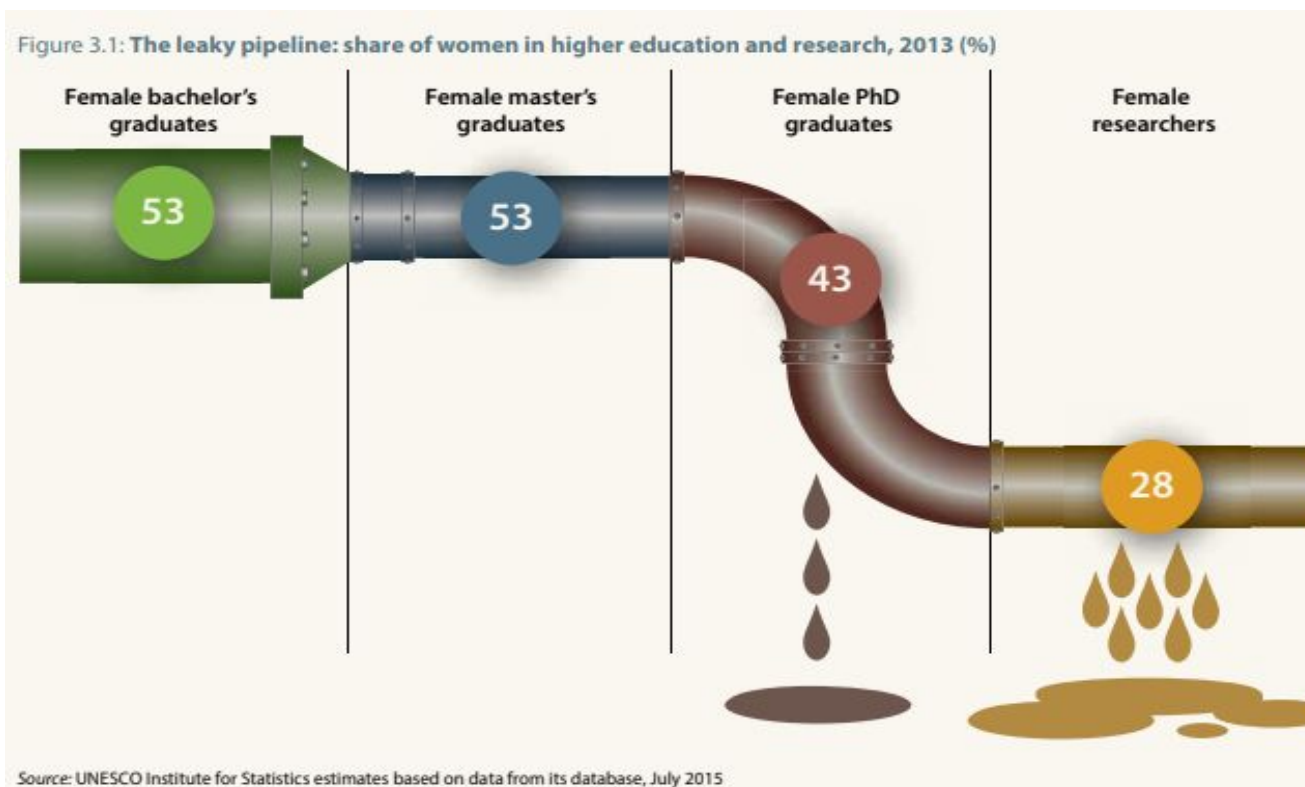
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„Leaky pipeline“

- People from discriminated groups face more hurdles in reaching higher positions or degrees





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Gender Paradigm

Before 1975: Women seen as less capable/interested in math → deficit theory dominated





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Gender Paradigms 1975-1980

- **1975–1980:** Liberal stereotyping → equal environment can enable women to develop skills
- **1980–1990:** Difference theory → women have different skills/experiences → feminist perspectives value women's knowledge
- **1990–2000:** Gender construction → identities shaped by society; postmodern view: gender is arbitrary and socially learned

Liberal Stereotyping 1975–1980s

- In an equal learning environment, women can be on par with men in mathematics and develop talent, skills, and interests.
- Equal treatment of genders in coeducational classes was proposed.



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Geschlechterparadigmen 1980 bis 2000

Differenztheorie: 1980-1990

Wenn es um Mathematik geht, haben Frauen andere Fähigkeiten, Interessen und Erfahrungen als Männer.

Radikalfeministisch: Die Erfahrung und das Wissen von Frauen in Mathematik sollten wertgeschätzt und positiver und konsequenter angesprochen werden.

Geschlechterinklusiv: Der Lehrplan und die Unterrichtspraxis werden geändert, um Dinge einzubeziehen, die Frauen interessieren und in denen sie gut sind, um den Aufbau ihrer mathematischen Stärken zu fördern.

Geschlechterkonstruktion: 1990-2000

Gesellschaftliche Interaktionen konstruieren Geschlechteridentitäten und diktieren die Machtverteilung zwischen den Geschlechtern.

Postmodern: Geschlecht ist willkürlich und nicht festgelegt und wird durch die Gesellschaft erlernt. Es gibt Unterschiede zwischen den Geschlechtern.

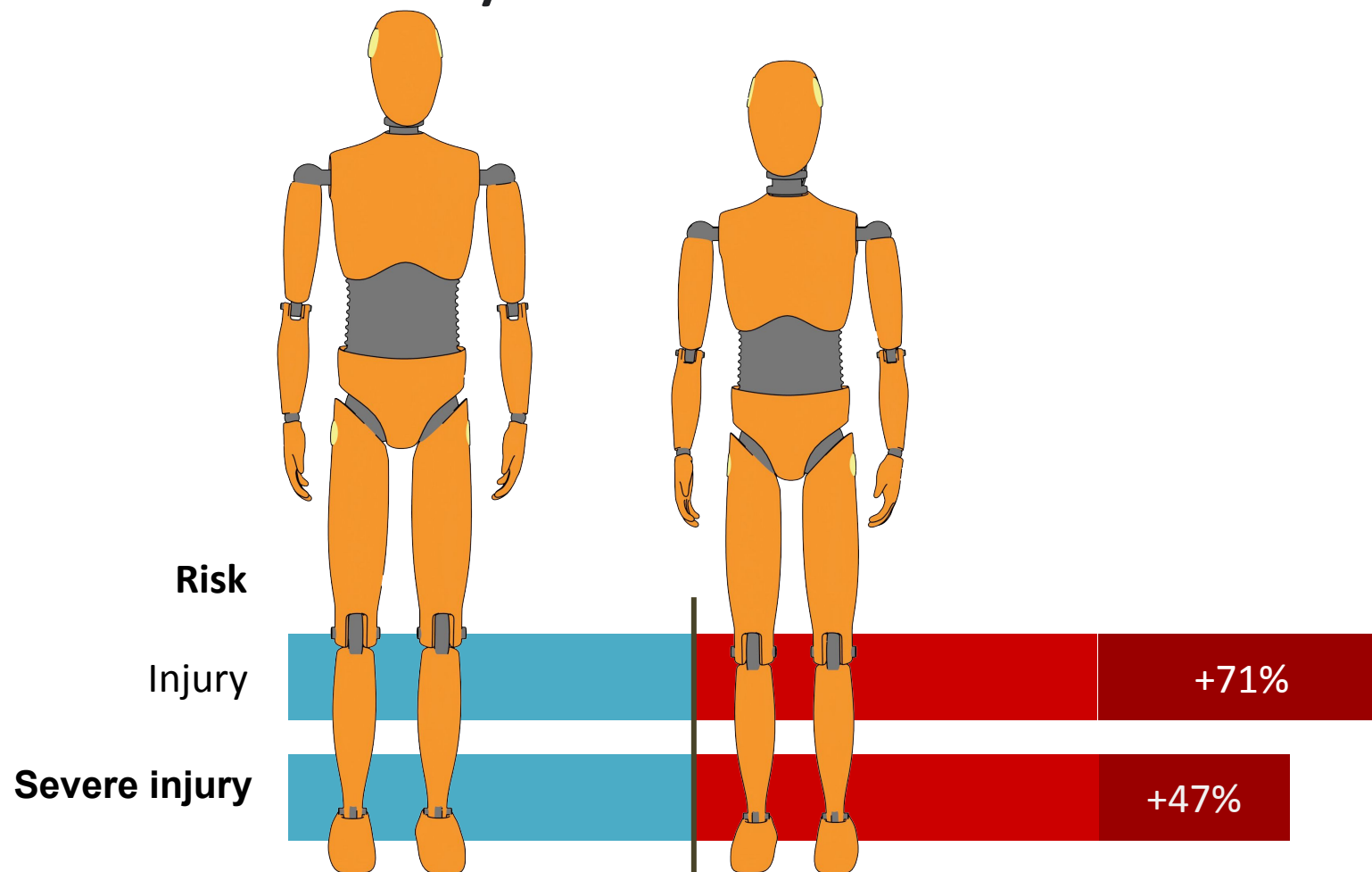
Geschlechtersensibilität muss angesprochen werden, ein stärker schülerzentrierter Unterricht muss in Betracht gezogen werden.

Discrimination Examples



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Safety of women in cars





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- Dummies are designed based on male bodies
- Women's seating position is different
- More injuries [4]

A good example of more research being based on men





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Sprache von Männern wird zuverlässiger erkannt
als die von Frauen



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Many tools were designed for men, i.e., for large hands
Women may not be able to use them
Example: Surgical instruments


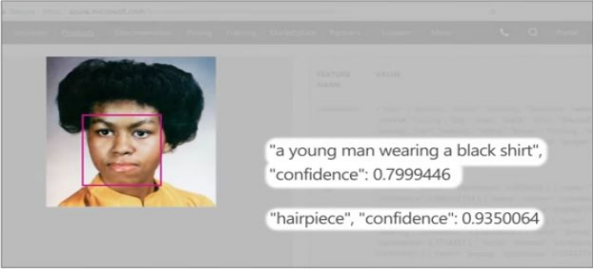
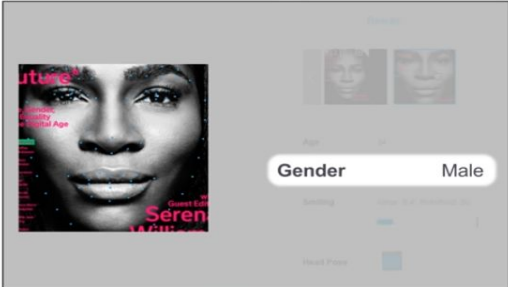
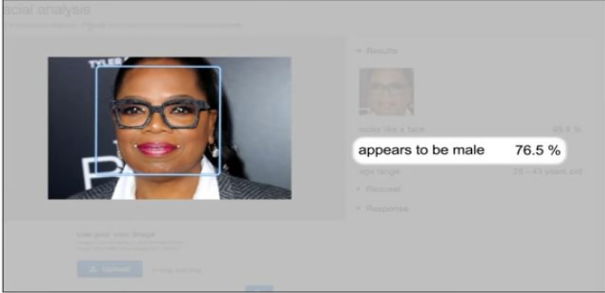


Quelle: deepai.org



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Intersectional problems – facial recognition

	<p>Michelle Obama</p>  <p>Microsoft</p>
<p>Serena Williams</p>  <p>Face++ 旷视</p>	<p>Oprah Winfrey</p>  <p>amazon</p>

Solution approaches



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Expected outcomes of gender-specific teaching and education

Contribute

Contribute to reducing the gender gap in STEM by recruiting and retaining more female teachers and students

Create

Create an inclusive learning/teaching environment

Support

Support and inspire decision-makers in developing policies and action plans



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Equality Plans

- Data on gender distribution in all roles and leadership positions
- Annual reports and evaluation of the process and outcomes

Plans and policies are published on the institution's website and are known across the institution

Requirements:

- Commitment of the entire organization
- Training and professional development for teachers and decision-makers

Requirements:

- Funding (allocation of resources)
- Time dedicated to gender equality work



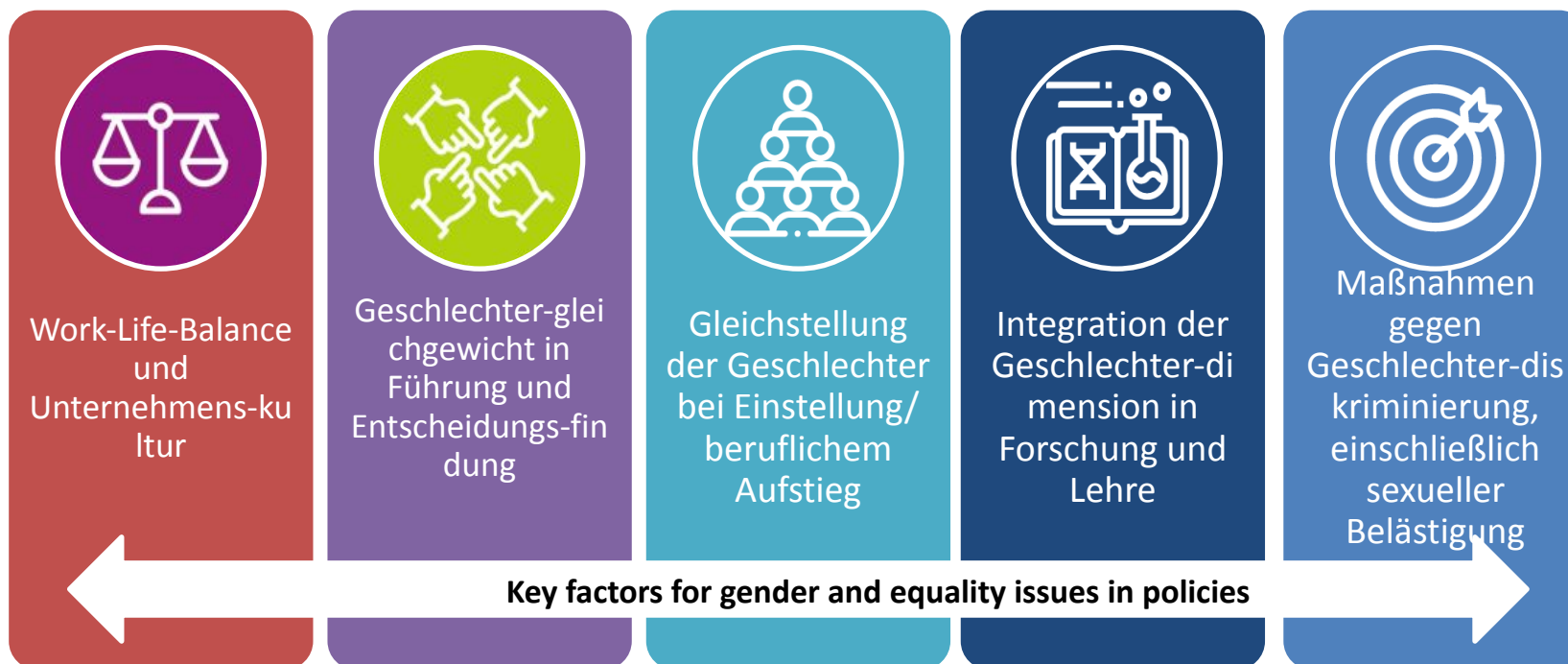
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Integration of gender issues





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Influence of language



Gender-sensitive language

Biological sex

Sex assigned at birth based on reproductive organs

Social gender

Gender based on social traits/opportunities. It is s

Gender identity

One's self-understanding of gender. This can be male, female, a mix of both, neither, or something entirely different.



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Gender-sensitive language

- Vocabulary is constantly evolving
- Important: Stay informed about which terms are becoming established to make language more gender-neutral
- Challenge: Unconscious discrimination caused by lack of awareness
- Recommendation: In conversations and documents, remain gender-neutral or use both the male and female forms



Quelle: deepai.org



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Pronouns

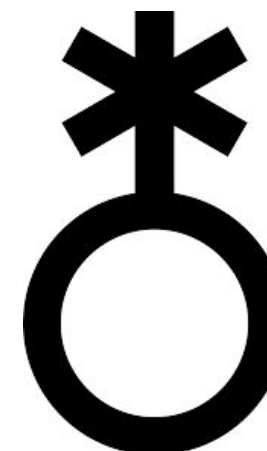
The simplest way: *“What are your pronouns?”*

Reducing barriers:

→ Establish sharing pronouns during introductions

→ Add pronouns after your name in written communication

Neutral pronouns in German: *xier, xie, nin, sier, sif, es, per, dey, en, em, ...*



Quelle:
<https://www.deviantart.com/pride-flags/art/Nonbinary-873787439>



Interactions

Adapt language to the context

Avoid stereotypes in examples and actions

Pay attention to interactions with men and women: Are there differences (intentional or unintentional)?

→ Men are given the floor first

→ Responses for some people are shorter

→ Some people are made invisible



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Interactions

... in Groups

Equal groups \neq equal opportunities

Group members should be as diverse as possible to bring in many perspectives

Different roles should be tried out (moderator, note-taker, etc.)

→ With support from the teacher



Quelle: deepai.org



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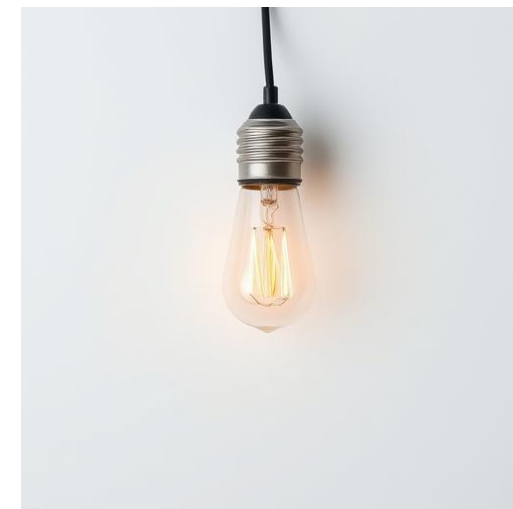
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Practical relevance

- Address stereotypes rather than reproducing them
- Self-reflection is essential
- Be aware of your influence on learners
- Adapt teaching methods
- Dedicate time and attention to different students
- Consider students' roles in groups, projects, and courses
- Use diverse examples
- Select literature thoughtfully
- Dedicate time and attention to different students



Quelle: deepai.org



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Domination techniques



Quelle: deepai.org

- Making invisible
- Ridiculing
- Withholding information
- Attributing blame, no matter what is done
- Imposing guilt and shame



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Domination techniques

Those affected are confused and feel bad

Mostly: men use these techniques against women

Withholding information

Attributing blame, no matter what is done

Imposing guilt and shame



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Beispiel – Unsichtbar machen

Handlungen von Tatpersonen

Direkt: Name wird nicht genannt, man wird übergangen

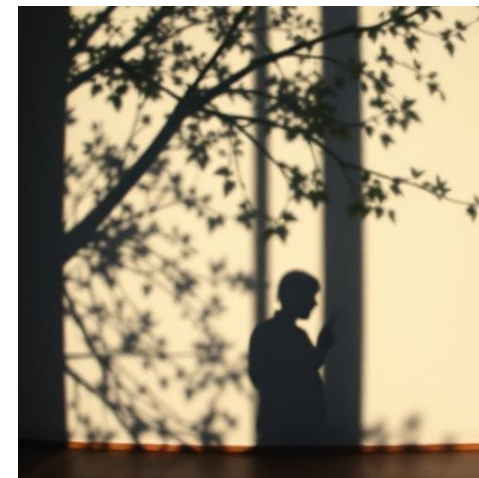
Indirekt: - Es wird bewusst nicht zugehört (Husten,
andere Beschäftigung, die Lärm macht, ...)

- Machen sich die Ideen der betroffenen Person zu eigen

Gegentechnik – Platz einnehmen

Nie mit lachen, Witze auf Kosten von sich selbst nicht zulassen

Fragen auf logischer Ebene stellen und Erklärungen verlangen



Quelle: deepai.org



Example – Ridiculing

Perpetrators:

- Make jokes at others' expense
- Portray another person or their arguments as stupid and unimportant
- Treat the person like a child
- Those affected feel unimportant

Counter-technique – Asking questions:

- Never laugh along
- Do not allow jokes at your own expense
- Ask questions on a logical level and demand explanations

Validation technique:

- Respect and take everyone seriously
- Ask others about their ideas and opinions to give them mental space



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Checklist

Collaborative editing (separate document)



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Any Questions

Resources

- [1] Oberhofer, E. Chirurgische Instrumente für Frauenhände oft schlecht geeignet. *Uro-News* **27**, 7 (2023). <https://doi.org/10.1007/s00092-023-5733-8>
- [2] Berhe, A.A., Barnes, R.T., Hastings, M.G. et al. Scientists from historically excluded groups face a hostile obstacle course. *Nat. Geosci.* 15, 2–4 (2022). <https://doi.org/10.1038/s41561-021-00868-0>
- [3] Stoet, G., Geary, D.C. The Gender-Equality Paradox in Science, Technology, Engineering, and Mathematics Education. *Psychological Science* 29(4) (2018). <https://doi.org/10.1177/0956797617741719>
- [4] <https://www.tagesschau.de/wissen/gesundheit/auto-crashtest-verkehrsunfaelle-100.html> (16.12.2024)
- [5] <https://www.npr.org/2012/07/12/156664337/stereotype-threat-why-women-quit-science-jobs> (16.12.2024)
- [6] <https://eige.europa.eu/gender-mainstreaming/toolkits/gear>