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

Embedding gender in daily teaching Workshop 1 some examples

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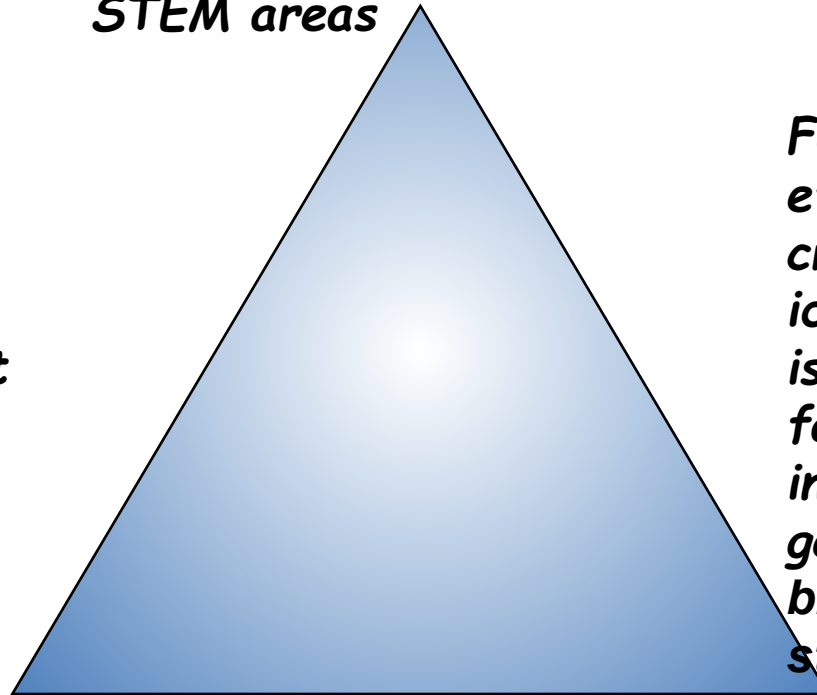
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Main goals

Develop knowledge about how to generate an inclusive gender oriented environment in the STEM areas

Foster efficiency by critically identifying issues that facilitate integration of gender to breaking down stereotypes

Find examples that can be used to facilitate the development inclusiveness in teaching, and education.



Before starting: let's play!



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

Memory Association Test results

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



Different levels

Macro level

Gender Equality Plans and Policies
intended goals: Intersectionality and diversity
Responsible: Managers and decision makers

Micro Level

Gender issues in daily teaching
Teachers and educators

Goals and issues in gender and equality plans

- Data on gender of staff across roles and leadership
- Annual reports and evaluation of progress and outcomes

Presupposes:

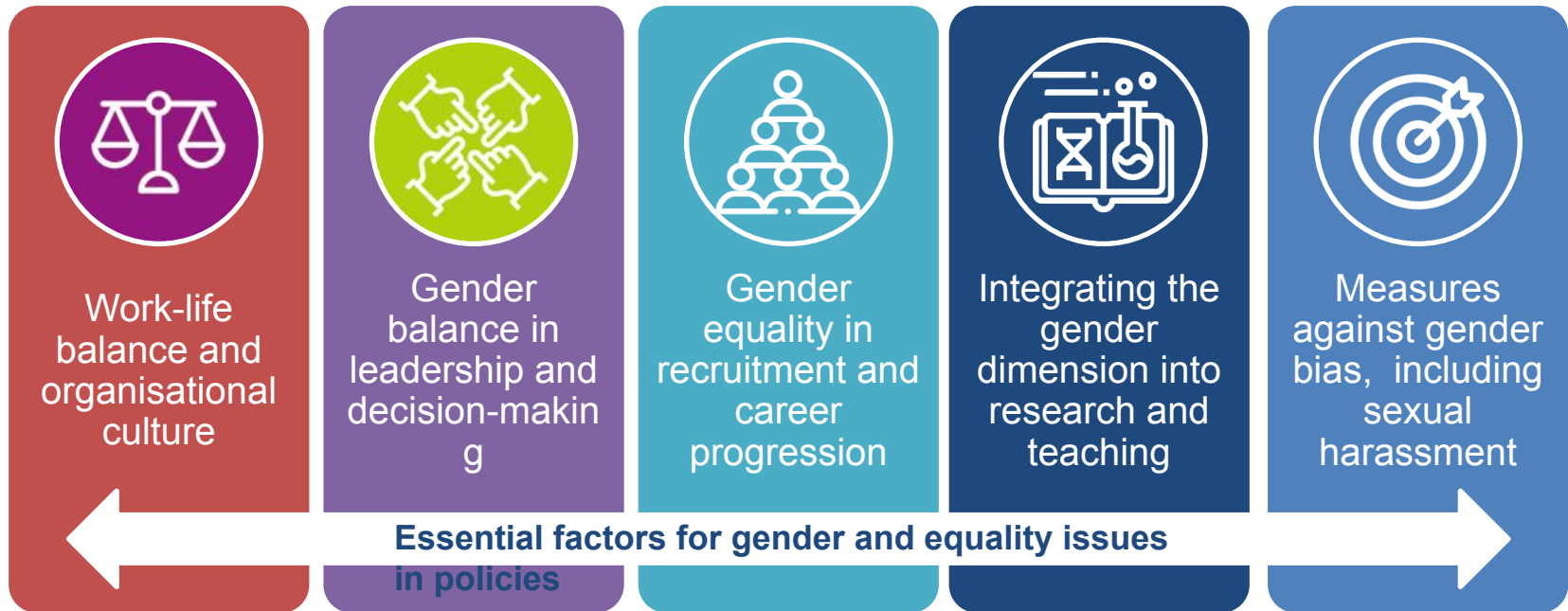
- Whole organisation engagement
- Education and training of teachers and decision makers

- Plans and policies are published on the institution's website
- Disseminated through institution

Presupposes:

- Funding (allocation of resources)
- Reserved time to work on gender equality

Integration of gender issues



Expected outcomes of gendering teaching and education

Contribute

Contribute to diminish the gender gap in STEM by attracting and keeping more female teachers and students

Create

Create and inclusive learning/teaching environment

Support

Support and inspire managers on how to develop policies and work-plans



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The paradox 2018 and further

STEM careers are generally secure and well-paid but the risks of not following such a path can vary.

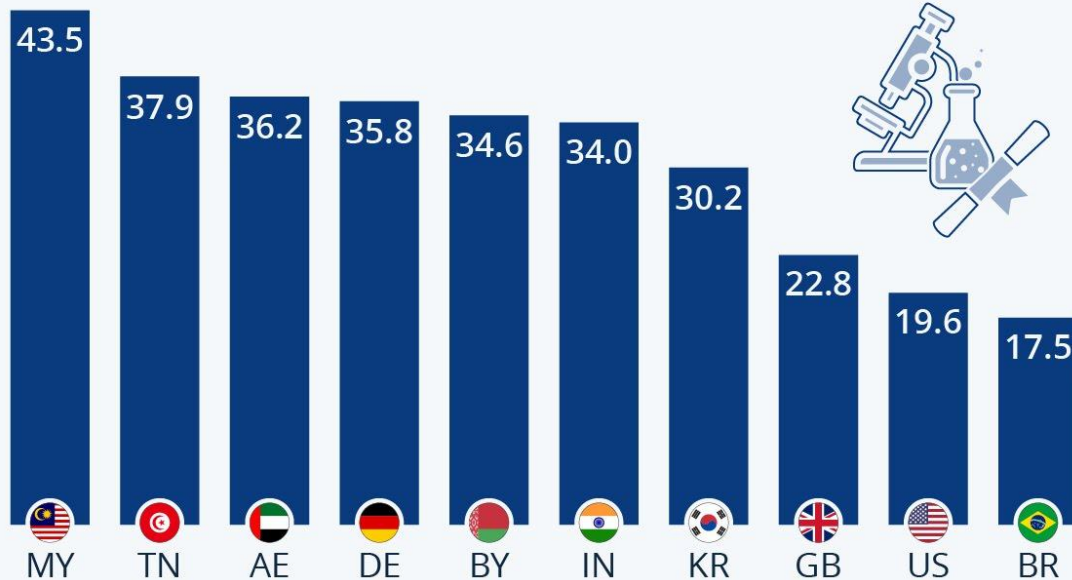
In more affluent countries, where any choice of career feels relatively safe, women may feel able to make choices based on non-economic factors.

Conversely, in countries with fewer economic opportunities, or where employment might be precarious, a well-paid and relatively secure STEM career can be more attractive to women.

Ref : Psychological Science, Gijsbert Stoet, 2018

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

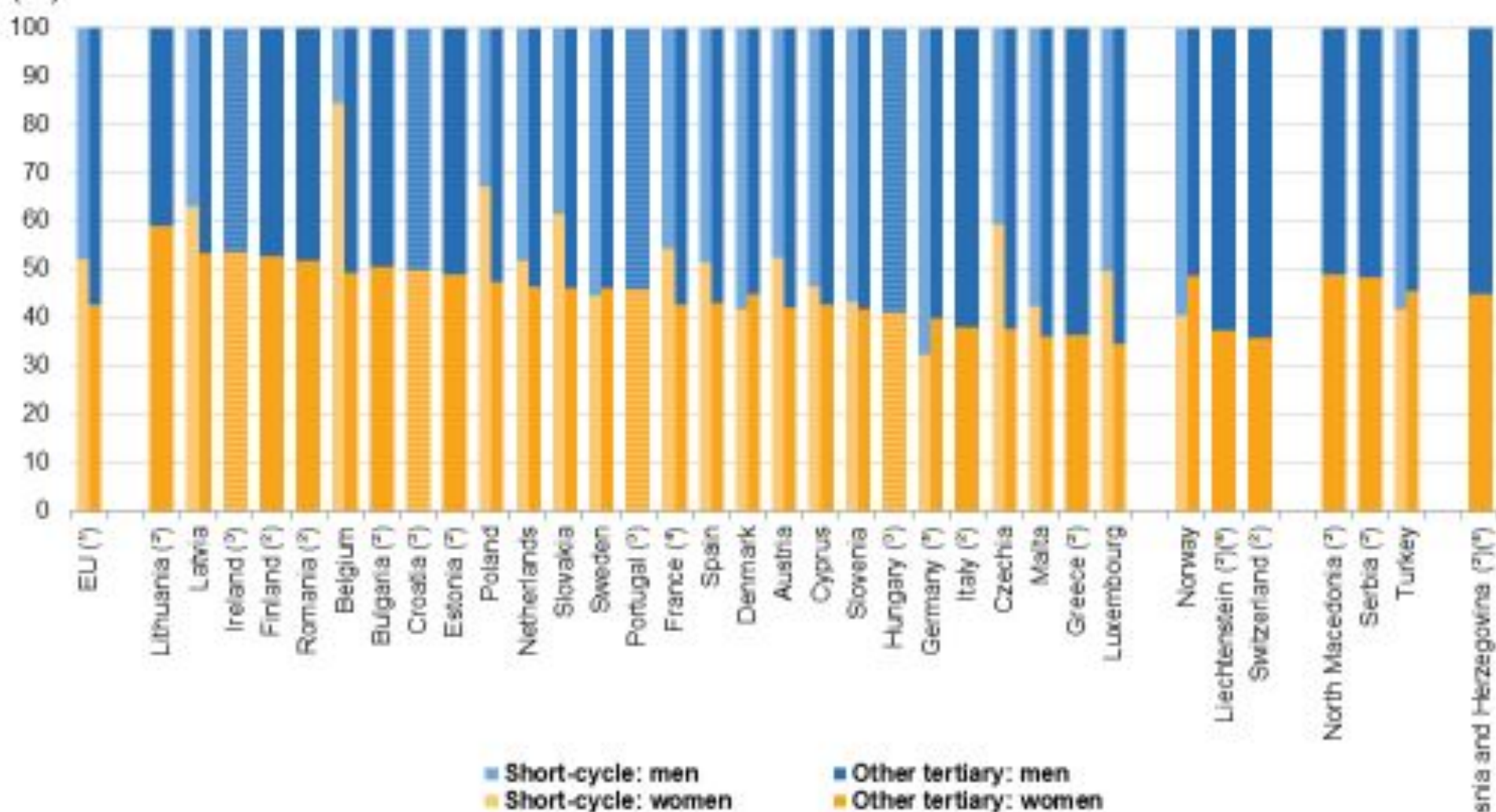
Source: UNESCO Institute for Statistics



statista

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.

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

(*) Short-cycle tertiary: not applicable.

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

(*) Excluding private institutions.

(*) Estimate.

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Diminishing gender bias in daily teaching

Some examples

How to be aware you are bias?

Culture in the classroom ?
We work already with
inclusiveness

What is an inclusive pedagogy?
Any difference between other
pedagogies?

Language and terms
Which terms are non-inclusive?

We do not discriminate against
women. And we do not have
problems with female
students.

What we do expect from our
students ?
Demanding to use different
teaching methods in the same
course.

A gender oriented pedagogy
focuses only in one group

Different pedagogical models in
the same course.
Are they gender related ?

What includes gender ?
Can I apply gender issues even
when my students are only
males?

Gender balance through language

Many people think of the terms “sex” and “gender” as interchangeable. While these two terms are connected, the picture is not as simple.

SEX is what you were assigned at birth, based on a combination of physical feature

Gender refers to the social attributes and opportunities associated with being male and female and the relationships between women and men and girls and boys, as well as the relations between women and those between men. These attributes, opportunities and relationships are socially constructed and are learned through socialization processes. They are context/ time-specific and changeable.

Gender determines what is expected, allowed and valued in a woman or a man in a given context. In most societies there are differences and inequalities between women and men in responsibilities assigned, activities undertaken, access to and control over resources, as well as decision-making opportunities. Gender is part of the broader socio-cultural context.

GENDER IDENTITY is your innermost concept of self as female, male, a blend of the two, or something else

Gender balance through language

- The vocabulary of gender continues to evolve and there is no universal agreement about the definitions of many terms.
- Nonetheless it is always worth doing our best to stay informed. The precise use of terms in regard to gender can have a significant impact on overcoming many of the misperceptions and biases associated with gender.
- *“in all written documents and where appropriate and feasible in oral expression, either explicitly use the **female and male forms** or **gender-neutral terms**.”*

Singular “they”

- **The most gender-inclusive way to talk about a person in English is to use singular “they”. The singular they is used in 3 main contexts:**
 - 1. To refer to people who specify their pronoun to be “they”
 - 2. To refer to people whose gender is unknown to us/the speaker,
 - 3. To refer to people whose gender is irrelevant for the specific context. (*“I fell on the street, but somebody helped me up. It was so nice of them”.*)

Considerations

Language use, stereotypes and intersectionality.

Language use, stereotypes and strategies for interaction in the learning environment

- Change your teaching style and language use between lectures, lessons, “case” exercises, seminars, project work, labs and other elements of the course in order to accommodate the needs and learning styles of different students
- Avoid perpetuating stereotypes and pay attention to the opinions and perceptions that women and men express, through your way of speaking and through the examples used in teaching. Avoid assuming that everyone recognizes what you are talking about.
- Does everyone really know and understand the examples that you address
 - Do I use language that perpetuates stereotypes?
 - How do I give feedback and affirmation to the students?
 - Pay attention to how much time and space men and women respectively take up in group discussions and how that develops in educational settings.

Intersectionality

- Equal groups do not automatically lead to equality.
- In order to fully utilize the strength and experience of the group members, it is important that members of a group have complementary skills and experiences of various kinds.
- Take time to form a good and functional group founded on trust, confidence, and fair treatment, and be attentive to the division of work during project work and/or laboratory work.
- Teachers and students should be jointly responsible for students rotating between different roles.

Voices from students



Interaction between teachers and students
Students and students



Shorter answers to some groups or individuals



Male students first



“invisible “ students , traditional patterns , etc

Man as norm

There are many of the lecturers who talk about a civil engineer as "he", some occasionally say "he or she", however, have never heard anyone refer to civil engineers as "she".

Culture, Visual representations



FIGURE 1.8 Johannes Kepler (1571–1630).

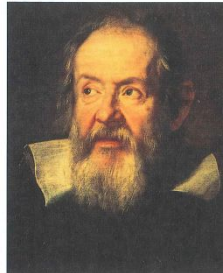


FIGURE 1.9 Galileo Galilei (1564–1642).



FIGURE 5.1 Sir Isaac Newton (1642–1727).



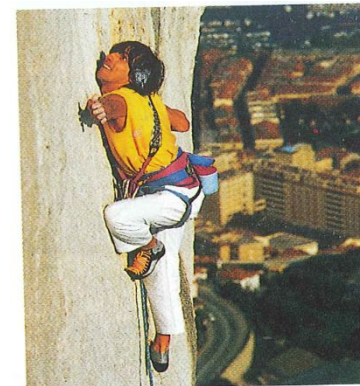
FIGURE 6.2 Gottfried W. Leibniz (1646–1716).



Although the mass of Edwin Aldrin, Jr., had not changed, his weight on the moon was roughly one-sixth his weight on earth.

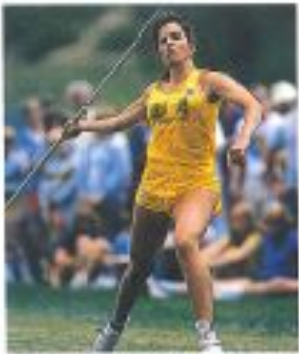


A weightlifter does work to lift weights but not to hold them at rest.

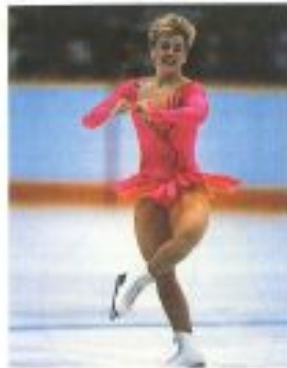


The climber has done work to increase his potential energy.

Culture, visual representations



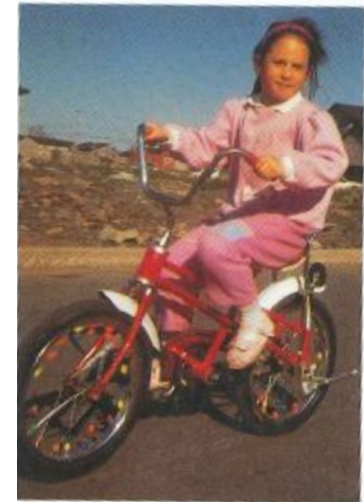
The net work done on the javelin is equal to the change in its kinetic energy.



Elizabeth Manley controls her angular speed by varying her moment of inertia.



During a grand jeté, a ballet dancer appears briefly to "float in air". However, the center of mass still follows a parabolic path.



What do you notice about the front wheel?

Seeing through gender-tinted glasses

Gender inclusive methods are based on the perception that gender is significant in learning, knowledge and teaching.

This means, in turn, that lecturers must reflect on the concept of gender, critically examine the significance of gender in their subject area and question any preconceived notions we may have regarding gender and its consequences in teaching.

- Conducting gender inclusive teaching may involve becoming aware that students can be received differently depending on, their sex, that there are different conceptions of men and women, and thus the expectations placed on them can be different.
- As a lecturer it is important to reflect on:
 - the attention and time students receive
 - the roles they get in the classroom, projects or seminars
 - the type and length of feedback students receive
 - the examples used
 - the selected course literature

Behaviour to be counteracted

It is possible that you experience that the course on which you are teaching may not have any obvious direct relationship to gender (examples are courses in solid mechanics and quantum mechanics), but teaching is a social activity, and this means that it is necessary to be aware of more than just the subject of study.

Some subtle oppression techniques, “master suppression techniques” are related to gender and gender inclusion.

An awareness of these techniques makes it possible for lecturers, to make the master suppression techniques visible, and to counteract them.

The five master suppression techniques identified by Ås are:

- Making invisible
- Heap blame/put to shame
- Ridicule
- Withholding information
- Double bind

Example

Ridicule

Ridicule is, for example, making jokes at the expense of others. It may also be presenting another person or their arguments as silly and unimportant; using, for example, striking but inapplicable comparisons. One version of ridicule is infantilization. This involves treating someone as a child, and taking on the role of adult who knows best: (“Oh, honey/sweetie/my dear girl, what on earth are you doing?”). Whatever the subject of the ridicule subsequently says or does, she has a lower value in the eyes of others. Being exposed to ridicule may cause a feeling of worthlessness.

For example:

- You attempt to present something important, but your colleagues laugh at your accent and say that you sound like a person in a popular TV series.
- A colleague makes disparaging remarks about your appearance in front of other people.

Counter-technique – Questioning

Do not allow jokes or comments based on ridicule to pass unnoticed. Never join in the laughter but bring the conversation to a halt and request an explanation.

Remain composed and logical and make it clear that you do not accept this treatment. Analyze the ridicule and ask the perpetrator to clarify what is meant. It can be helpful to repeat what has been said verbatim and ask for an explanation (“What do you mean when you say that a woman would not be able to deal with it?”).

Validation technique – Respecting

Respect and treat all people seriously. Pose questions about the ideas and points of view of others, in order to give them mental space.

Example

Double bind

The double bind leaves you feeling that whatever choice you made, it will be the wrong one. If you work conscientiously, you may be described as slow, but if you work rapidly, you are accused of carelessness. It may also be a case of the priorities you assign. If you channel most of your efforts into work, you're accused of neglecting your partner, while if things are the other way around, you're considered to lack drive. To be punished no matter what choices you make can lead to you investing all of your time and energy into trying to "do the right thing". This means that you are allowing other people to tell you what to do and how to do it. You have become powerless.

Counter-technique – Break free of the pattern

Consider your own priorities and understand how you reached them. Inform others who are affected by your choices of the priorities you have set. Remember that you know what is important in your life and what is important to you.

Validation technique – Double reward

Try to view things from the perspective that everyone does as well as they can in the circumstances. If a person arrives late to a meeting, it may be more rewarding to believe that the person did his or her best to arrive on time. Then, use this as an opportunity to hold a discussion about the importance of arriving on time. Take this approach rather than becoming irritated.

This perspective means, for example, that you understand that when a person declines to participate in a certain activity it only means that the person is declining the activity, not the relationship itself.

Example

Making invisible

The technique of making a person invisible conveys that the material provided by the person is not important or useful. The aim is to make the person feel insignificant and insecure.

The technique can be applied in a direct form with words and/or body language, or it may be used indirectly.

Direct

- Your name is not used.
- Your work is referred to in dismissive terms.

Indirect

- Attention is directed away from you through disturbing noise such as the scraping of chairs, rustling of papers, coughing, etc.
- No one takes any notes or poses questions that show they are listening.
- Someone repeats what you have just said as if it were their own idea.
- If you are forgotten, dismissed or met with anything other than genuine interest, you may be the target of this technique.

Counter-technique – Take up space

Try to avoid becoming a victim or feeling belittled. It is important in this situation not to demonstrate anger or frustration: calmly claim your right to demand attention.

Action should be taken immediately, and it must be made clear that this behavior is not acceptable. On occasions when you are talking without being acknowledged, it may be a good idea to stop talking and make the point that it is important to you that the others listen properly.

In many cases, it may be necessary to make the perpetrator aware of what you experience as unacceptable behavior. “Did you really say...?”, “Do you mean that...?”, “Well, I think you have neglected to introduce me by my name”.

Power strategy

Making invisible

Ridicule

Withholding
information

Double bind

Heap blame/put to
shame

Counter-technique

Take up space

Questioning

Cards on the table

Break free of the pattern

Intellectualisation

Validation technique

Visibilising

Respecting

Information and
inclusion

Double reward

Setting
reasonable
standards and
conflict resolution

Examples of gender bias in the literature

Sex



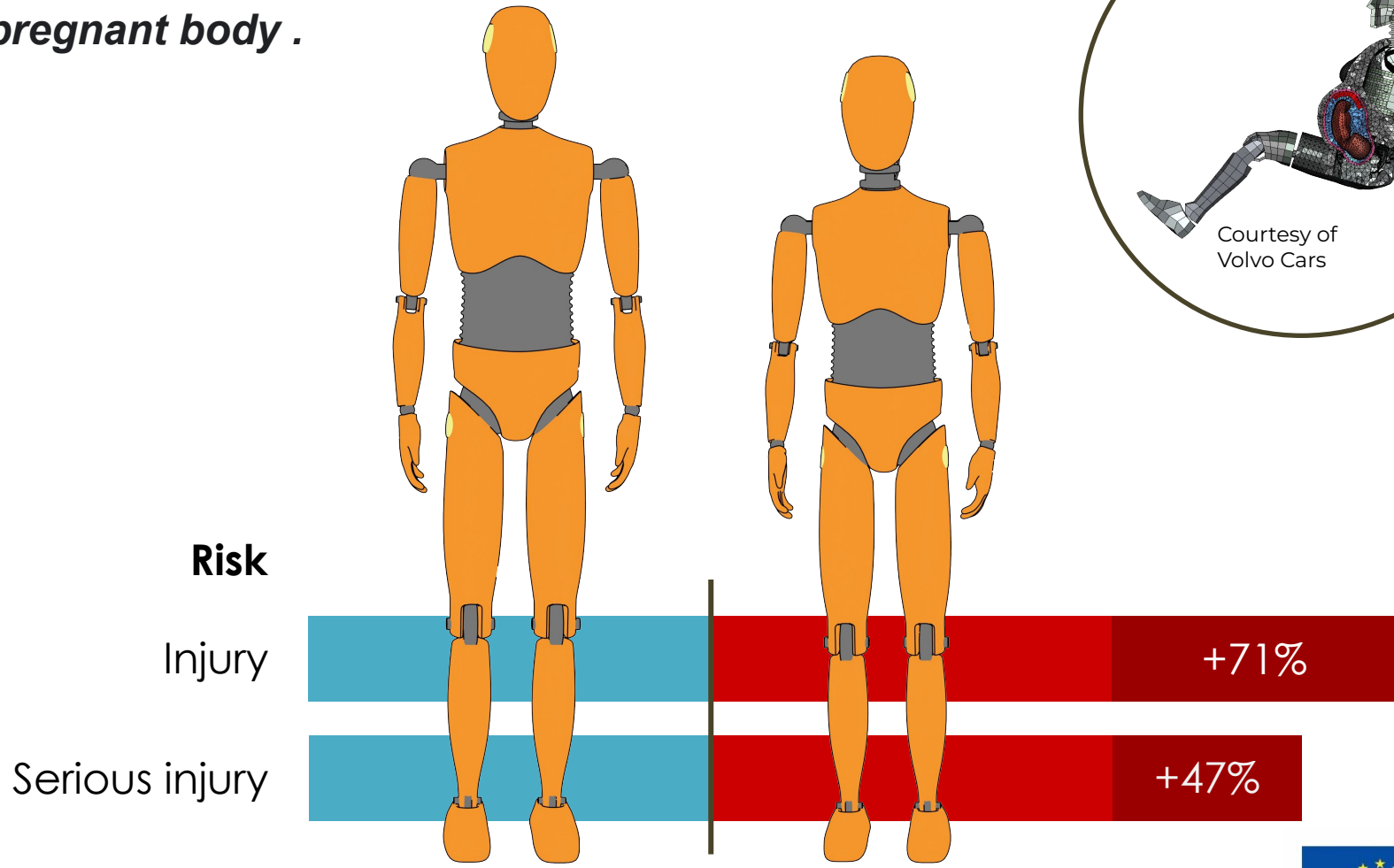
Gender



Ainsworth, Claire. (2015). Sex redefined. *Nature*, 518(7539), 288.

Safety of women's bodies as drivers ?

in pregnancy, the risk of death in a collision is 3 times higher for the fetus than for the pregnant body .



Intersectional factors: Facial recognition programs recognize men more easily than women

. Do not recognize easily non-white individuals

amazon

Microsoft

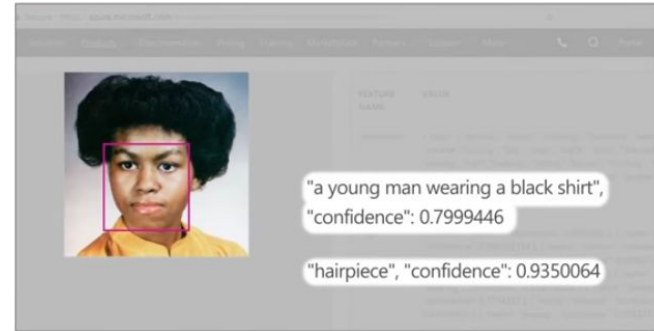
IBM

Face++ 旷视

Google

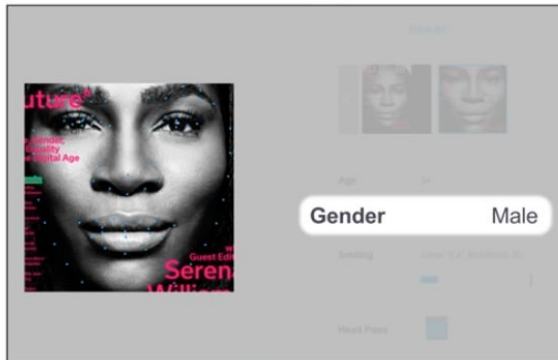


Michelle Obama



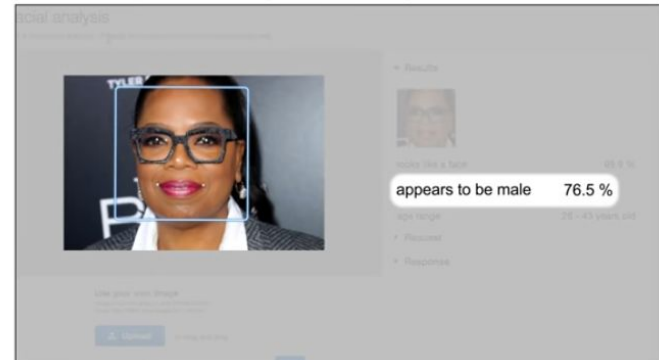
Microsoft

Serena Williams



Face++ 旷视

Oprah Winfrey



amazon

Does your digital assistant understand what you say?



Google's speech recognition was found to have a 70 percent greater chance of correctly understanding what men say, compared to what women say

Tools are in many cases designed for people with large hands.

Work tools are made for a big hand,

In some areas there are very few women who will be able to use those work tools in a good way.

Many studies shown that women become injured when they use work tools that do not consider gender differences



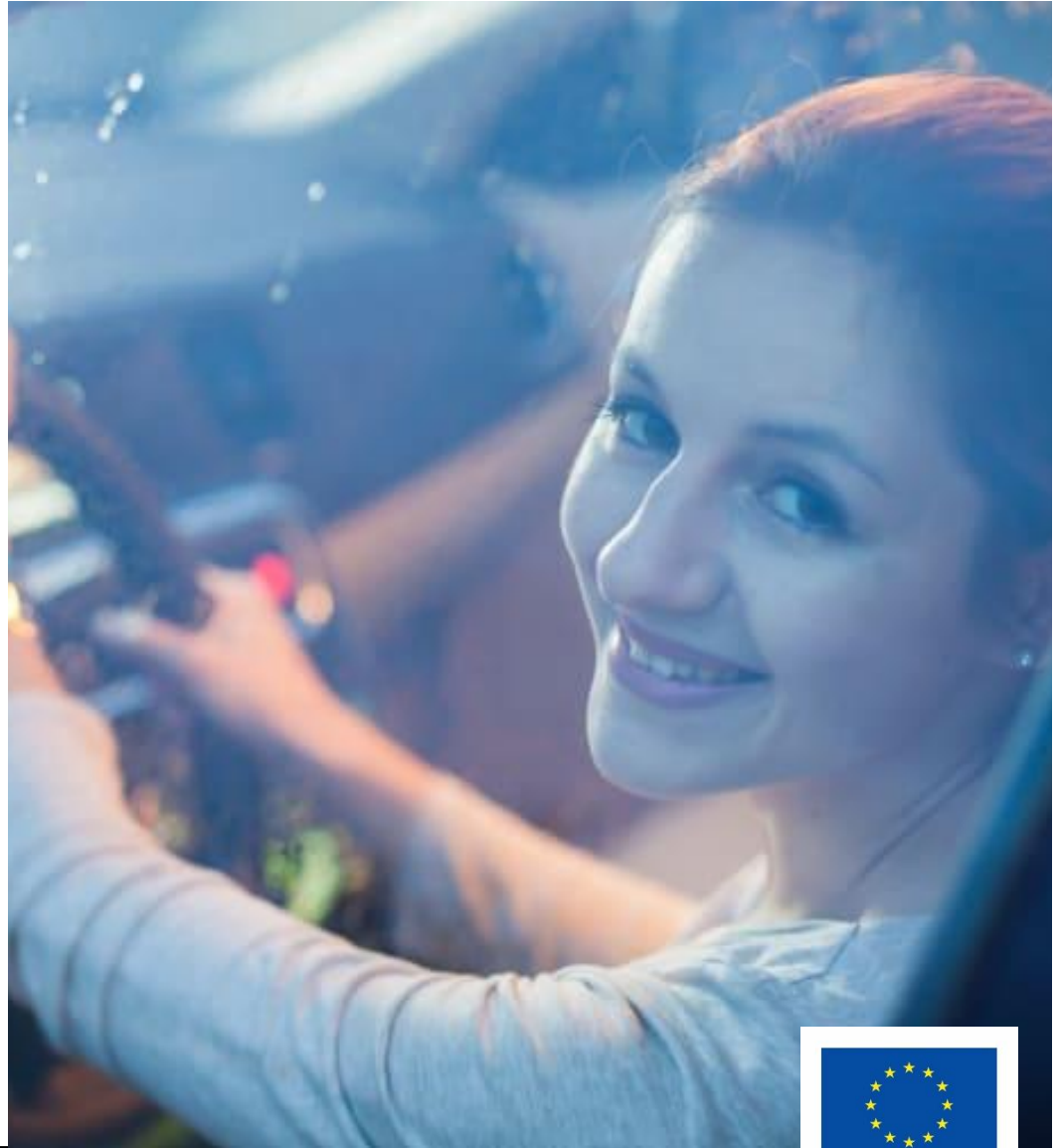
Intersessionality and algorithms

- Joy Buolamwini who couldn't be detected by a facial recognition.
- She couldn't be detected by facial recognition until she put a white mask
 - Algorithmic justice league
<https://www.ajl.org/>
 - Joy Buolamwini
https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms



Out-of-position drivers

Women are often shorter than men and therefore have to sit further forward to reach the pedals, and often sit more upright to be able to see over the dashboard for a better view. There is more research on men even in car safety



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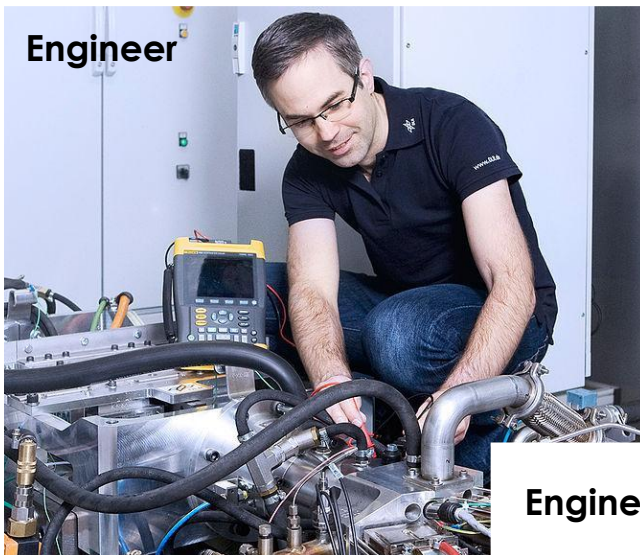
Exclusionary
design?

- <https://youtu.be/WHynGQ9Vg30>
- Doesn't recognize skin other than white



Who works with what?

Vem skapar tekniken?



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Check list for teachers

How to stimulate and practical apply women and men skills, experiences and values

- Continuously review the course literature used in exercises and laboratory sessions from a gender-aware perspective. Examples of aspects to consider are:
- Are both women and men present in the literature and in the examples discussed in your classes, laboratory sessions and groupwork?
- What are the ways in which women and men are presented in the course literature and in the examples used in your classes and laboratory sessions?
- What are the ways in which they are discussed?
- What do the various descriptions and explanations concerning women and men express?
- Invest time in forming a positive and well-functioning group in which trust, confidence and fairness form a natural base.
- Be aware of the ideas and perceptions of women and men that you convey through the way you speak and the examples you use when teaching.
- Be aware of how different examples are described in the literature – are they intended to be read by women or men, or are they neutral in this respect?
- Use material and examples that are considered by all students to be inclusive.
- Consider how you read, assess and evaluate the students' texts.
- Be continuously aware of the criteria you use for assessing laboratory sessions, exercises, etc., and never cease to examine these critically. Remember that your ideas about gender can influence your assessment of a text, since we take it for granted that either a woman or a man has written the answer. On many occasions we base our reading on the assumption that a particular sex has produced the text, and we include our ideas about people based on sex.
- Be aware of how vocal the women and men in the group are. Also consider how this develops in different teaching situations.
- Be aware of how the work is distributed during projects and laboratory sessions.
- When projects or laboratory sessions are carried out in groups, the teacher and the students must be jointly responsible for ensuring that the students take turns in adopting different roles.

Examples gender inclusive examples

- **How Stereotypes Can Drive Women To Quit Science**

- <https://www.npr.org/2012/07/12/156664337/stereotype-threat-why-women-quit-science-jobs>

- The gender gap

- <https://www.issuesonline.co.uk/articles/how-to-beat-gender-stereotypes-learn-speak-up-and-react>

- **Solving the Gender Gap in Computer Science and Gaming**

- <https://www.stemwomen.com/solving-the-gender-gap-in-computer-science-and-gaming>

- **Gender in mathematic**

- https://www.google.com/search?q=gender+in+mathematics++films+and+videos&tbm=isch&ved=2ahUKEwj-up2Py7r-AhWNwyoKHVSCBYEQ2-cCegQIABAA&oq=gender+in+mathematics++films+and+videos&gs_lcp=CgNpbWcQA1AAWIUmYM0naABwAHgAqAFJiAGHDJIBAJl4mAEAoAEBqgELZ3dzLXdpei1pbWfAAQE&sclient=img&ei=bE1CZP7UKI2HqwHUhJaICA&bih=520&biw=1280&rlz=1C1GCEB_enSE901SE901#imgrc=UP6x9ZF2eK0J0M

References



[Gender Equality in Academia and Research - GEAR tool | European Institute for Gender Equality \(europa.eu\)](#) Provides



The Gender Equality in Academia and Research (GEAR) tool provides universities and research organisations with practical advice and tools through all stages of institutional change, from setting up a gender equality plans.



real impact.

Questions to be discussed

-
- How do teachers act to avoid that factors such as gender, ethnicity, age, social background, religion, etc. are not used as a categorization principle?
 - How do teachers avoid students using terms that may be perceived as offensive by other students?
 - How do teachers handle issues that are related to norms, principles or that are governed by regulations, and that are of importance to the work?

The gender paradigm

Theoretical background
1975 to 2000

(In case you want to show progression in the manner to discuss and handle gender issues over the time)



Gender Paradigm 1975- 1980

Paradigm before 1975; Main focus on women and man interest for maths

Little awareness and attention was paid to gender differences.

Gender issues focuses only on differences between male and female.

- Use of Deficit Theory to explain differences in interest on Math.

Women were assumed being less capable, less interested and less skilled than males

- Mal gender Stereotyping dominated

Mathematics was assumed being the domain of males.

Liberal Stereotyping 1975-1980s

Given an equitable learning environment, women can be the mathematical equals of men and are capable of developing talent, skills and interest.

Equal treatment of the sexes in co-educational classrooms were suggested

Gender Paradigm 1980 and further

Difference Theory: 1980-1990

When it comes to mathematics, women just have different skills, interests and experiences as compared to males

Radical Feminist

The female experience and knowledge of mathematics should be valued and more positively and consistently addressed

Gender-Inclusive

The curriculum and classroom practice is altered to include things females are interested in and good at, to encourage the building of their mathematical strengths

Gender Construction: 1990-2000

Societal interactions construct gender identities and dictate the distribution of power across genders.

Postmodern: Gender is arbitrary and not fixed and is learned through society.

There are differences amongst genders. Gender sensitivity issues must be approached a more student-centered classroom must be considered.

Leaky pipeline today

- All over the world, there is the phenomenon of the “[leaky pipeline](#)” of lost talent. Girls are attracted to science at school, and actually make up the majority of science graduates with bachelor’s degrees. Even at master’s level women are in the majority. However, at the PhD level and in research, the number of women drops significantly, illustrating the “leaky pipeline” where talent is lost at each stage.

