



**European
University Cyprus**

LAUREATE INTERNATIONAL UNIVERSITIES



Inquiry in Science and Math
Education Research Group

STEM education and sensitivity to gender issues

**Being sensitive to gender
issues related to learners**

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STING

**STEM Teacher Training
Innovation for Gender Balance**

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What we will do in the next 2 hours or so...

1. Reflect on what we have discussed, found and learned in the previous activities about issues related to gender balance.
2. Reflect on what authentic STEM-related teaching looks like.
3. Describe issues related to gender sensitivity to characteristics of authentic STEM teaching.

Reflection

In small groups, reflect on what we have discussed, found and learned in the previous activities about issues related to gender balance.

Summary of some issues from the literature about improving gender imbalance.

... by the way, there are many more!

How to make science teaching more interesting for all

- **Interesting topics**
 - Instead of starting from the abstract laws and, the starting points are social and environmental topics that apply to students' lives such as leads in petrol, household appliances, X-rays or roller skates (*Zohar & Sela 2003*).
- **Meaningful learning (less is more...)**
 - A suggestion is to **eliminate some of the topics included in the current curriculum** in order to enable teachers to devote more time to fewer topics in order to make time for teaching for understanding (*Zohar & Sela 2003*).
- Overall, research shows that to enhance students' interest in STEM, the topics taught at school **should be carefully chosen** (*Christidou, 2007*).

How to make science teaching more interesting for all

- **Teaching for exam Vs. teaching for identity building**
 - STEM classes might be a place where students could take up identities like environmentalist, feminist, or smart health-care consumer (Greenfield, 1997).
- **Making connections to communities of practice**
 - The teacher could work toward connecting students to relevant communities of practice outside of school for example, swung the pendulum, poured the water, rolled the cars, etc.—while others recorded data, kept counts, timed trials, etc., or did not participate at all (Greenfield, 1997).
- **Teacher preparation...**
 - When teachers cover topics about which they are well-prepared, they encourage student questions and discussions, spend less time on unrelated topics, permit discussions to move in new directions based on student interest, and generally present topics in a more coherent way (Kahle & Rennie, 1993; Leder, 1990; NSF, 1998).

How to make science teaching more interesting for all

- **The role of inquiry oriented approaches and activities**
 - Research indicates that students' attitudes about and/or perceptions of science are positively incensed by inquiry-oriented teaching strategies that involve:
 - Interactive, stimulating laboratory experiences.
 - A non-competitive environment (Brownstein & Destino, 1994; Griffard & Wandersee, 1998; Teel, Debruin-Parecki, & Covington, 1998).

How to make science teaching more interesting for all

- **Informal science activities**

- Involvement in **out-of-school informal science activities** (such as museum visits, after school discussions, or television watching) has proved to be strongly associated with a commitment to STEM learning and a positive perception of the relevance of science (*Christidou, 2007*).

- **The socio-scientific aspect...**

- It is expected that if topics such as energy production and use, the greenhouse effect, or atomic, biological, and chemical weapons are not presented as scientific “facts”, but along with their moral, political, and social implications, they will be faced as more relevant and equally appropriate for girls and boys (*Christidou, 2007*).

- **In terms of classroom environment...**

- Teachers **need to provide a supportive learning environment which emphasizes communication, interpersonal negotiation, interaction amongst all participants, harassment-free discussion and harassment-free, active participation by students** (*Parker, H. & Rennie, J. 2010*).

The role of the interaction between boys and girls

What can we learn from single sex groupings in STEM...

- Some research suggests that girls will develop more positive attitudes towards physics if they are taught separately from boys, because interaction with boys 'may actually increase rather than decrease stereotyping' (Vockell and Lobonc 1981: 217).
- Single-sex grouping can be a useful strategy for **providing space for female students to develop a positive sense of 'femaleness'**, but only if it is part of an overall systematic approach within a school (Parker, H. & Rennie, J. 2010).
- it is critical to understand the circumstances and conditions under which it may be useful to separate boys and girls (Parker, H. & Rennie, J. 2010).

Girls' increased participation in science

- **Over the last ten years or so:**
 - girls' participation in STEM education at senior secondary and early tertiary levels in most OECD countries has increased considerably.
 - Girls their levels of achievement are now, on average, either equal to, or higher than those of boys.
 - However, these increases have not been accompanied by corresponding increases in the levels of participation and achievement by women in scientific and technological sectors of the workforce (Gilbert & Calvert 2003).
- Women have entered the field of STEM education in increasing numbers and have had a significant impact on the way we understand science teaching, curriculum, assessment, the social context of science classrooms, and teacher education (Brickhouse, 2001).
- Feminist efforts focused on getting more girls into STEM by providing them with early positive experiences and encouragement from teachers, counselors, and other adults (Brickhouse, 2001).

More points to consider...

- **After school activities**
 - Include real life situations
- **Home support & involvement of parents**
 - Productive
 - Non-productive
- **Expectations of teachers**
- **Teacher sensitivity**
- **School-based actions:** problematic
- **Be sensitive in teaching characteristics and styles that are more productive for girls**
 - Communication
 - Interaction
 - Active participation
- **Consider student needs and concerns**
- **Subjects need to consider student preferences**

More points to consider...

- **Pedagogical issues to consider:**
 - Reduce number of topics.
 - More in depth.
 - Supportive learning environment.
 - Emphasizes communication.
 - Free Discussion.
 - Democratic style teaching.
 - Active participation by students.
 - Group work/collaboration.
 - Variety in evaluation methods.
 - Informal assessment procedures, with relatively open-ended tasks drawing on contexts which are familiar to both boys and girls.
- **Both teachers and students need to become aware about issues related to gender imbalance**
- **If it is a matter of perspective:**
 - Change perspective?
 - Highlight perspectives that are different and more women- sensitive.

Inquiry-based science teaching characteristics

Inquiry-based STEM teaching and learning

Inquiry is the intentional process of diagnosing problems, critiquing experiments, and distinguishing alternatives, planning investigations, researching conjectures, searching for information, constructing models, debating with peers and forming coherent arguments (Linn, Davis and Bell, 2004; S-TEAM project)

- Authentic and problem-based learning activities where there may not be a correct answer.
- A certain amount of experimental procedures, “hands-on” activities.
- Self-regulated learning sequences where student autonomy is emphasized.
- Discursive argumentation and communication with peers.

Inquiry-based STEM teaching

- From a goal of providing science education for scientists to **providing STEM education for all.**
- From an image of science education as what we know to science education **as teaching STEM as a way of knowing.**
- From an image of STEM education that emphasizes content and process goals to a **STEM education that stresses goals examining the relation between evidence and explanations.**

Inquiry-based STEM teaching

- From an emphasis on individual science lessons that demonstrate concepts to **lesson sequences that promote reasoning with and about concepts.**
- From the study of topics that examine current scientific thinking without regard for social context to **the study of science topics in social contexts.**
- From a view of science that emphasizes observation and experimentation to a view that stresses **theory and model building and revision.**

Some points

- An endeavor of explaining how natural phenomena work, not just learning calculus...
- Authentic & interesting topics
- “Community-based” and democratic
- Evidence-based
- Student centered

Reflection of teacher groups

Needs in different settings in terms
of “*raising good STEM education
practices for gender balance*”

In your group consider the following reflection points

1. Identify 2-3 problematic issues/situations etc related to gender balance in education in your country/ educational system that you can address through STING Teacher Professional Development (TPD) module in your context
2. What are the particular teacher needs in your country that you can address through STING TPD
3. Where and how to focus during TPD module in your context