Promoting Girls' Participation in STEAM: Guidelines for Teachers

This document is part of the Blooming Toolkit and aims at supporting teachers in designing, implementing and evaluating activities that can contribute to an increased participation of girls in STEAM.

The following step by step process is proposed:

1. **Read the document below and reflect on its main ideas, to understand**
    - the main causes of the gender gap in STEAM;
    - the types of actions that can support bridging this gap;
    - the risks to avoid, based on the research evidence.

2. **Choose one or more of the personal stories of women from the past in STEAM** and prepare an interesting and engaging activity, based on the video and on the associated documents.
    - Take into account that this is an opportunity for students to understand the contribution of women to STEAM

3. **Choose one or more of the scientific articles explained** in an accessible language in the Blooming Toolkit and design an interactive learning activity inspired by the corresponding lesson plans
    - Take into account that the activity can have multiple benefits, including:
        - Present role models to girls and illustrate gender equality to boys
        - Provide opportunities for girls to experience success in STEAM
        - Provide opportunities for all students to cooperate from positions of equality

4. **Observe the behaviour of students, both girls and boys**, during the activities and identify:
    - aspects of the activities that worked well and could be further emphasised;
    - aspects of the activities that did not work as expected and that you should change or avoid in the future;
    - needs that should be addressed in future activities.

5. **Go back at the recommendations below** and identify what other types of interventions you may choose, to further promote diversity and inclusion in STEAM

6. **Consider sharing your experience with colleagues and encourage them to proceed in a similar way.**

Why Focus on Girls in STEAM?

Achieving gender equality is a core value of the European Union, rooted in Article 2 of the EU Treaty. The EU Gender Equality Strategy 2020–2025 highlights the goal of creating a society where individuals, regardless of gender, have equal opportunities to pursue their chosen paths. This includes addressing gender disparities in STEM (Science, Technology, Engineering, and Mathematics), where women remain underrepresented.

Details about the gender gap in STEAM in the countries involved in the Blooming project, are available in the dedicated reports.

Understanding the Causes of the Gender Gap in STEAM

Based on the specialized scientific literature, we can identify three main types of causes for the gender gap in STEAM: structural discrimination, gender stereotypes, and low self-efficacy.

1. Structural Discrimination:

- The education system often reproduces mechanisms that enforce gender stereotypes, sometimes unintentionally and even with good intentions.
- Such discrimination limits girls' opportunities in STEM and can be perpetuated by cultural and societal norms.

2. Gender Stereotypes:

- Deeply ingrained societal beliefs associate technical and intellectual skills with men. These biases can discourage girls from pursuing STEM.
- Gender is a social construct, and societal stereotypes are learned and internalized by both men and women.

3. Low Self-Efficacy:

- Girls often lack confidence in their STEM abilities due to societal messaging and internalized stereotypes, leading to lower participation rates.
- The "glass ceiling" effect, self-fulfilling prophecies, and stereotype threats further hinder their progress.

Intersectionality

In understanding the gender GAP in STEAM it is important to consider that the combined effects of gender stereotypes, social status, and cultural factors create additional barriers for many girls.

Effective Strategies for Teachers

1. Cultivate a Supportive Environment:

- Foster an inclusive classroom that emphasizes equality, equity, rights, and free choice. Ensure that all students feel welcomed and encouraged to engage in STEM activities.

2. Address Gender Bias:

- Actively counteract stereotypes by showcasing diverse role models and providing examples of successful women in STEM. Highlight how mistakes are a natural part of learning and innovation.

3. Promote a Growth Mind-set:

- Encourage perseverance and emphasize effort over innate talent. Teach students to view challenges as opportunities for growth.

4. Design Inclusive Activities:

- Create learning experiences that integrate real-life applications of STEM and encourage collaboration. Ensure equal participation in both technical and non-technical roles within group projects.

5. Provide Targeted Support:

- Offer mentorship, resources, and structured guidance to build confidence and skills in STEM.

Ineffective Practices to Avoid

- Overemphasizing Stereotypes: Highlighting that women are underrepresented in STEM or frequently discussing gender disparities can reinforce negative perceptions. (Cheryan, Master & Meltzoff, 2015)
- Gender-Segregated Initiatives: Organizing "girls-only" STEM clubs may signal that girls require special accommodations or cannot compete with boys in STEM fields. Instead, create inclusive programs for all genders. (Hughes et al., 2013)
- "Pinkification" of STEM: Marketing STEM activities to girls using gendered stereotypes trivializes the subject and alienates those who do not conform to stereotypical "feminine" interests. (Abraham & Barker, 2023)
- Assuming Equal Treatment = Equity: Treating all students identically without addressing specific barriers faced by girls allows inequities to persist. (Hill et al., 2010)
- Overloading on Role Models: Overemphasizing "exceptional" women in STEM can create the perception that success requires extraordinary abilities or sacrifices. Introduce relatable role models with diverse career paths. (Betz & Sekaquaptewa, 2012)
- Praising Effort Without Supporting Skill Development: Solely encouraging girls to "try harder" without providing resources, feedback, or structured guidance may lead to frustration. (Dweck, 2006)
- Assigning Girls Non-Technical Roles in Group Work: Allowing girls to take on only organizational or creative roles reinforces stereotypes and limits their skill development. (Sadker & Sadker, 1994)
- Focusing Solely on Increasing Numbers: Increasing the number of girls in STEM without addressing the quality of their experience is insufficient. (Carlone & Johnson, 2007)
- Emphasizing "Innate Talent" Over Effort: Highlighting "natural genius" as a key to STEM success perpetuates the myth that STEM requires innate ability. Promote perseverance and learning. (Dweck, 2006)
- Ignoring Implicit Bias in Teachers and Peers: Teachers and peers may unconsciously discourage girls' participation in STEM through subtle cues. (Hill et al., 2010)
- Ignoring Intersectionality in STEM Interventions: One-size-fits-all approaches fail to address unique challenges faced by diverse girls. (Crenshaw, 1989; Ong et al., 2011)

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