#ASEFClassNet14

14th ASEF ClassNet Conference

Gender Equality: Reprogramming STEM Education

27-30 November 2018, Helsinki & Espoo, Finland

Concept Note

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lärkan

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"Only 17 Women have won a Nobel Prize in physics, chemistry, or medicine since Marie Curie in 1903, compared to 572 men. Today only 28% of all the world's researchers are women. Such huge disparities, such deep inequality, do not happen by chance."[1]
~ Irina Bokova ~

Topic Overview

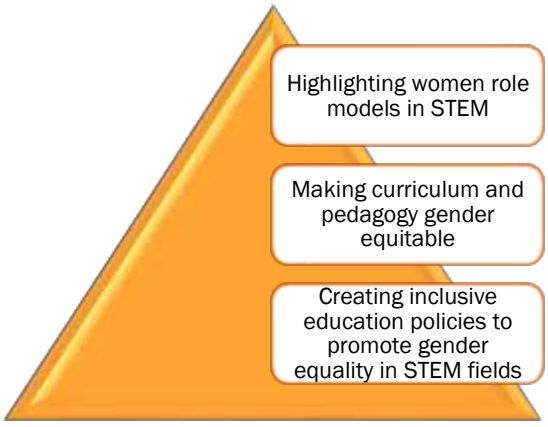
In today's knowledge-based economy, STEM (Science, Technology, Engineering and Mathematics) skills are crucial for innovation.[2] Besides, there is a growing interest in STEM subjects to find solutions to tackle contemporary global challenges. A survey conducted by ManpowerGroup in 2015 highlighted a global "talent shortage" of 38%, where the top 10 hardest jobs require STEM skills.[3] On top of that, even with the growing demand for STEM professionals, the participation of women in these fields remains noticeably low.[4]

The UNESCO Sustainable Development Goals emphasize the need to empower women at all education levels to promote gender equal societies.[5] There is an urgency to encourage more women to study STEM subjects in their early stage of schooling. Likewise, it is important to ensure that young people, both girls and boys, are provided with equal opportunities in schools to learn STEM subjects to prepare both for jobs and gain all skills that are necessary to navigate through today's complex and rapidly changing world.

14th ASEF ClassNet Conference

Launched in 1998, the ASEF Classroom Network (ASEF ClassNet) fosters collaborations among secondary and high school teachers and students in Asia and Europe while harnessing the potential and opportunities of technology in education. To-date, more than 1,400 teachers from 45 ASEM Partner countries[6] have joined the ASEF Classroom Network. In addition, more than 32,000 students have been engaged in 398 school-to-school collaborations since 2001.

The 14th ASEF ClassNet Conference will take place from 27-30 November 2018 in Helsinki & Espoo, Finland, and focuses on the theme *"Gender Equality: Reprogramming STEM Education"*. The promotion of a gender balanced participation of STEM professionals for achieving the Sustainable Development Goals is at the heart of this conference. The conference addresses the following 3 topics: (1) women role models in STEM, (2) gender equitable curriculum and pedagogy for STEM, and (3) inclusive education policies to promote gender equity in STEM fields.



These three topics will promote necessary and timely discussions among all the relevant stakeholders at secondary education level and empower them with the right knowledge and awareness needed to increase more women participation in STEM fields.

1. Women Role Models in STEM

Women are still noticeably under-represented in STEM, especially in math-related science fields. The National Science Foundation, a United States government agency, reports that the women's participation in science and engineering has stopped increasing over the last decade.[7] According to

Breda, Grenet, Monnet & Effenterre, "in 2004-2014, the share of women among undergraduate degrees awarded in engineering and computer science has stagnated around 20%, while it has decreased in mathematics and statistics (from 46% to 43%) and physical science (from 42% to 40%). Similar trends are observed in almost all OECD countries (OECD, 2016), where fewer than 1 in 3 engineering graduates and fewer than 1 in 5 computer science graduates are girls."[8] Breda, Grenet, Monnet & Effenterre (2018) also conducted a large-scale randomized experiment to assess the influence of a short in-class intervention of a female role model on students' attitudes to science. The intervention found that it positively influenced the students' perspectives towards science subjects. Result of this experiment clearly indicates that initiatives need to be taken to highlight female role models in STEM to inspire more girls to study STEM subjects.

Topics to be addressed during conference:

- Barriers faced by women in STEM
- Breaking the STEM ceiling for girls
- Impact of including more women in STEM

2. Gender Equitable Curriculum and Pedagogy

Development of the curriculum and pedagogy to ensure gender equality is linked to various aspects of teaching and learning, particularly, teachers' interaction with the students in the classroom. An international research during the early 1990s established that even teachers committed to the idea of equal opportunities interact differentially with girls and boys in the class which may place girls at a disadvantaged position.[9] Even in the 21st century, girls feel less confident about their performance in mathematics and science subjects although they do equally well as boys.[10] This shows that more and continuous encouragement and intervention from teachers' side and schools are required to increase girls' confidence and motivation to study STEM subjects. However, while girls need to be more encouraged, it is important that educators avoid associating gender equity with a superficial focus on girls' education to the exclusion of boys and move towards a more comprehensive understanding of gender.[11] Moreover, it is crucial to carefully look at the following issues - curriculum content, learning methods, language of instruction and literacy, and finally methods of evaluation and assessment to make the curriculum and pedagogy more gender equitable.[12] All in all, it is vital to discuss the issues that have both direct and indirect impact on creating gender biased curriculum and pedagogy to increase awareness among different stakeholders, specially to change teachers' and school leaders' perspectives.

Topics to be addressed during conference:

- A good school programme for both girls and boys
- Strategies to enhance students' confidence, competence, and self-efficacy in STEM subjects
- Opportunities for interactions with role models to explore career options in STEM

3. Inclusive Education Policies to Promote Gender Equality in STEM Fields

Schools play a crucial role in shaping girls' and boys' experiences of STEM education. Recently, there is a significant decline in the number of girls taking advanced-level STEM subjects in high school. Differences in the teaching of mathematics and sciences at secondary school can significantly influence girls' and boys' achievement in these subjects, which impacts their choice of subjects for taking in higher education.[13] School level activities aimed at expanding girls' choices include curriculum and teaching which promote gender equality, and the effects of professional training for teachers. Girls and boys can demonstrate equally good results in mathematics and science when they are given equal opportunities to build their self-confidence and develop their potential.[14] Based on the form of education governance in the country, schools may exercise different degrees of autonomy in developing policies to promote STEM. Schools may adapt national, regional, state or county policies for day-to-day school operations. It is therefore, important to grant a certain autonomy to schools and empower them to develop policies that support gender equality in STEM education and meet the needs of both girls and boys.[15]

Topics to be addressed during conference:

- Policies that promote gender equality in STEM at school level
- Key stakeholders involved in the development of gender-responsive STEM educational policies
- The impact of cultural practices on girls' and or boys' engagement in STEM

[1] See Foreword note by the former UNESCO Director-General Irina Bokova in UNESCO (2017a) on pg. 5, "Cracking the code: Girl's and women's education in Science, Technology, Engineering and Mathematics (STEM)".
[2] European Commission (2015), "EU Skill Panorama 2014: Science, technology, engineering, and mathematics (STEM) skills. Analytical Highlight".
[3] UNESCO (2016), "Closing the gender gap in STEM: Drawing more girls and women into Science, Technology, Engineering and Mathematics (STEM). UNESCO Asia-Pacific Education Thematic Brief".
[4] UNESCO (2016), "Closing the gender gap in STEM: Drawing more girls and women into Science, Technology, Engineering and Mathematics (STEM). UNESCO Asia-Pacific Education Thematic Brief" & UNESCO (2017b), "Measuring Gender Equality in Science and Enginieering: The SAGA Toolkit, Working Paper 2".
[5] UNESCO (2017c), "Education for Sustainable Development Goals: Learning Objectives".
[6] See 51 ASEM Countries.
[7] National Science Foundation (2017), "Women, Minorities, and Persons with Disabilities in Science and Engineering".
[8] See pg. 2 in Breda, T., Grenet, J., Monnet, M., and Effenterre, C. (2018). Can female role models reduce the gender gap in science? Evidence from classroom interventions in French high schools. Working Paper N° 2018 – 06. Paris School of Economics.
[9] Robinson, K. (1992). Class-room discipline: power, resistance and gender: A look at teacher perspectives. *Gender Education*, 4 (3), 273-287. & Smith, D. (1992). A description of classroom interaction and gender disparity in secondary business education instruction. *The Phi Delia Epsilon Journal* 34(4), 123-193.
[10] OECD (2015), "The ABC of Gender Equality in Education: Aptitude, Confidence, Behaviour".
[11] (Akpakwu & Bua, 2014). Akpakwu, O.S. and Bua, F.T. (2014). Gender Equality in Schools: Implications for the Curriculum, Teaching and Classroom Interaction. Journal of Education and Practice, 5 (32), 7-12.
[12] (Akpakwu & Bua, 2014, p. 9) Akpakwu, O.S. and Bua, F.T. (2014). Gender Equality in Schools: Implications for the Curriculum, Teaching and Classroom Interaction. Journal of Education and Practice, 5 (32), 7-12.
[13] IBE-UNESCO (2017), "Training Tools for Curriculum Development: A Resource Pack for Gender-Responsive STEM Education" & UNESCO (2017b) "Measuring Gender Equality in Science and Engineering: The SAGA Toolkit, Working Paper 2".
[14] OECD (2015), "The ABC of Gender Equality in Education: Aptitude, Confidence, Behaviour".
[15] IBE-UNESCO (2017), "Training Tools for Curriculum Development: A Resource Pack for Gender-Responsive STEM Education".

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ASEF is an intergovernmental not-for-profit organisation located in Singapore. Founded in 1997, it is the only institution of the Asia-Europe Meeting (ASEM).

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VISUAL EXPLAINER

The universe as we know it has revolved around the concept of duality: good and bad, positive and negative, light and dark. However, as Yin and Yang in Chinese philosophy describe, these evidently opposite forces are interconnected and interdependent. The popular English idiom, 'comparing apples and oranges' is often cited to highlight incomparable elements or characteristics of two apparently different items. But are they really that different? Should they be treated as two different entities or rather as one which is bound together, complementing each other to form a mutual whole?

The advent of the 4th Industrial Revolution presents us with opportunities beyond the principles of duality and rigid divisions. Comparing apples and oranges seems possible. And the origin and stimulus of developing fresh perspectives are rooted in innovative and equal education.

ASEF's contribution is with the financial support of the European Union.