

APEC HRDWG Project

Cross-Border Human Capacity
Building for Glocalized Scientific Literacy

STEM-PLUS Education for Women and Girls Webinar



Organized by Chinese Taipei



 25th - 26th March, 2021

 GIS NTU Convention Center,
Locke Hall, Taipei

Project Overseer



Prof. **Mei-Hung Chiu**

Graduate Institute of Science Education
National Taiwan Normal University

Organizing Committee Members



Prof. **Shiang-Yao Liu**

Graduate Institute of Science Education
National Taiwan Normal University



Prof. **Kuen-Yi Lin**

Department of Technology Application and Human Resource
Development
National Taiwan Normal University

Welcome Address

Honorable guests and participants,

It is my privilege and pleasure to welcome all of you to join us in the 2021 STEM-Plus Education for Women and Girls Webinar, which is based on the APEC project “Cross-Border Human Capacity Building for Globalized Scientific Literacy for Future Citizenship: Phase 2-Longitudinal Exchange and Community



Formation of STEM-Plus Education for School Girls, Women and Teacher Professional Development”. The webinar will take place in Taipei from 25th to 26th March, 2021 and the event is co-funded by Asia-Pacific Economic Cooperation (APEC) and Chinese Taipei’s Ministry of Education. Due to the pandemic crisis, the event will be held in a hybrid mode, with both physical and virtual sessions, to provide participants with the highest quality of the presentations.

According to the UNESCO Institute of Statistics reports, fewer than 30% of the world’s researchers are women. There is a persistent gap between women’s and men’s access to resources, involvement, rights, payment, publications, and benefits in STEM. Regardless of regions, cultures, and/or status of economic development, this disparity can be found in STEM across the world. Our reality thus presents us with a serious challenge. But there are still opportunities for all stakeholders, including policy makers, researchers, and educational practitioners, to take a leading role to come up with a more diverse, equal, and inclusive policy and strategy as we strive for a better representation and participation of women and girls in STEM.

To deepen Regional Economic Integration, promote inclusivity, and explore relevant structural reform in the APEC region, this event intends to engage participants in collaboration, exchange, and joint-innovation to achieve the following objectives:

1. To provide constructive and sustainable exchange of STEM-Plus experiences and strategies on issues and products, ranging from curriculum design and implementation to emergent challenges arising from implementation of novel approaches in STEM-PLUS education.
2. To enhance science teachers’ competence on cultivating students’ scientific literacy through implementing innovative designs of science and technology curriculum standards for K-12 with an emphasis on the development of sustainable growth, in particular, for female learners, and
3. To share existing good practices on gender related issues in STEM-Plus fields that could be served as

vehicles to promote STEM-Plus education in different economies as well as regions.

In this webinar, distinguished speakers are invited to give keynote speeches to share their research, leadership, and experiences on STEM-Plus education, especially those on the gender issues. In addition, delegates nominated by their economies will give presentations on current implementations of STEM-Plus education in their economies and strategies dealing with gender issues. Also, panelists are invited to give talks on the topic “Supporting Women and Girls in STEM-Plus”. I believe that with contributions from speakers, delegates, and panelists, the webinar will be a platform where good ideas and innovations will emerge, be proposed, and shared, which will not only build participants’ capacity but also facilitate long-term improvement on STEM-Plus for women and girls.

Finally, I’d like to appreciate and acknowledge APEC for funding and supporting the project. I would also like to thank our Ministry of Education for their assistance and support of the project.

In conclusion, I hope you will enjoy the speeches, be inspired by the presentations and find the webinar a rewarding experience!

Stay safe and healthy!

Sincerely,



Mei-Hung Chiu

Project Overseer, APEC Project

Distinguished Professor, National Taiwan Normal University

Good afternoon, Ladies and Gentlemen,

It is my great pleasure to deliver the opening remark at the APEC webinar on STEM-Plus education for women and girls.

I deeply appreciate Chinese Taipei for hosting this important webinar as a part of the APEC project entitled “Cross-Border Capacity Building for Glocalized Scientific Literacy for Citizenship”.



As we know, the workforce shortage in STEM jobs has been an issue in recent years among APEC member economies. This phenomenon may be deeply associated with the low participation of females. In this regard, gender-balanced capacity building and human resource development are major agendas in 21 APEC member economies. We believe that women with STEM skills will have greater potential to facilitate economic growth among member economies.

Therefore, it is urgent to create a better environment for schoolgirls in STEM-Plus education. Moreover, we are committed to promoting women to pursue careers in the STEM field. With contributions from speakers, delegates, and experts, I believe the webinar will be a great platform to initiate individual capacity building and to inspire our members groundbreaking innovations in the implementation of STEM-Plus education.

We have numerous global challenges such as the socio-economic recession, pandemic, climate change among others. To combat these challenges, we must take necessary actions to create better a life for all individuals in APEC.

We are grateful for all stakeholders, who have taken the responsibility to advance STEM education for women and girls. Once again, I deeply appreciate your hard work. I’m confident that this webinar will be crowned with great success.

Thank you very much and let us enjoy the webinar!

Dong Sun Park
HRDWG Lead Shepherd, APEC

Dear colleagues and friends, ladies and gentlemen,
Good afternoon.

It is my great pleasure to attend APEC webinar on STEM-Plus education for women and girls.



As you know, the Education Network is committed to “foster strong and vibrant learning systems across APEC member economies, promote education for all, and strengthen the role of education in promoting social, individual, economic and sustainable development through cross-border education cooperation”. The webinar is aligned with the goal of the EDNET – “preparing today’s youth with appropriate education and training, skills, and to succeed in their local education system and compete in a globalized world”. In particular, it responds to the challenges faced by females in APEC region in acquiring competencies related to STEM and addresses the gender inequality that has been increasingly prioritized by member economies. Developing a friendly environment for girls will have a meaningful impact on the workforce in the future; the advance of STEM-Plus education is associated with the productivity and economic growth. Therefore, it is important to develop the workforce, including both males and females, dedicated to STEM careers.

However, in spite of girls’ the performance in subjects related to STEM in high school as well as their male peers do in many cases, fewer of females excel in the field of STEM than males. What are the obstacles and constraints? What are recent policy developments in member economies? What are potential solutions to resolve the challenges? Through the presentations and discussions in these two days, I hope that the webinar will inform and inspire the educators and policymakers on the above issues. I believe that these will bring positive changes to STEM-Plus education in APEC member economies and facilitate female participation in and contribution to technological innovation and economic growth.

Education is the cornerstone of development and quality growth. it is our duty to improve the its quality and enhance its equity towards the goal of inclusive and quality education for all.

I wish the webinar a great success.

Thank you very much!

Wang Yan

EDNET Coordinator, APEC HRDWG

Distinguished speakers,
Distinguished delegates from the APEC member economies,
Ladies and gentlemen,
Hello everyone!

Thank you all for taking part in this webinar on STEM-Plus Education for Women and Girls.

The Covid-19 pandemic has disrupted the entire world and prevented us from holding this 2-day workshop in person.



But this pandemic has also thrown a new light on the importance of STEM education - science, technology, engineering and mathematics - as communities and economies work to rebuild.

APEC economies have been working to create inclusive, balanced growth for many years now, and women play a crucial role in the development and prosperity of our Asia-Pacific region.

Research shows that giving women and girls access to STEM education plays a crucial role in social development, economic prosperity, and regional integration, as well as in individual students' lives

So working to ensure that women – and girls - can achieve their full potential in the STEM areas of education and training is essential.

It's also a wise investment.

But fostering economic growth and human resource development always presents a range of practical challenges, but we can all learn from each other.

On behalf of the Ministry of Education, I'd like to thank each of the speakers, delegates and participants taking part in this webinar.

I hope you all find it very informative and useful. Thank you.

Yen-Yi Lee

Director General
Department of International and Cross-strait Education of the Ministry of Education

Distinguished guests, ladies and gentlemen, good afternoon!

On behalf of National Taiwan Normal University, it is a great pleasure for me to welcome you to join this webinar on STEM-Plus education for women and girls co-funded by Asia-Pacific Economic Cooperation and our Ministry of Education.



There is no question that cultivating students with skills and knowledge in STEM is essential for the modern society. Yet, it has been well known that women and girls are under-represented in STEM fields. As such, to enhance economic growth and development, it is imperative for the world to encourage the other half of our global population, our sisters and daughters, to also be engaged in STEM.

National Taiwan Normal University has been aware of the importance of STEM-Plus education and thus has been encouraging faculty members to be devoted to creating a gender friendly curriculum and research environment for both male and female students. In alignment with the fourth and fifth goals of the UN's Sustainable Development Goals on Quality Education and Gender Equality, we also recognize the importance of the equality and equity of learning and understand it as the next step for STEM.

As we all know, we are all facing the challenges of promoting women and girls in STEM field. Through this webinar, I hope we will all be inspired and find better ways to move forward. Finally, I would like to show my utmost gratitude to APEC and the Ministry of Education for providing this great opportunity for NTNU to host this webinar. I would like to also thank the speakers, delegates, panelists, and moderators of this webinar for your participation and contribution as well as all the participants for being a part of this global effort for a more equal future of STEM.

I wish you all enjoy the wonderful speeches and presentations. Meanwhile, stay healthy!

Sincerely,

Cheng-Chih Wu

President, National Taiwan Normal University

Table of Contents

Agenda	10
Keynote Speakers.....	12
Delegates	24
Russia	24
Malaysia	25
Philippines.....	26
Vietnam	27
Chile	28
USA.....	29
Mexico.....	30
Peru.....	31
Nominated Delegates for Participation.....	32
Panelists.....	34

Agenda

Time	25 th March, 2021
12:30–13:00	Registration
13:00–13:25	Opening Ceremony Opening Remarks <ul style="list-style-type: none"> ➤ Prof. Dong Sun Park HRDWG Lead Shepherd, APEC ➤ Dr. Wang Yan Education Network Coordinator, APEC HRDWG ➤ Dr. Yen-Yi Lee Director General, the Department of International and Cross-strait Education of the Ministry of Education ➤ Prof. Cheng-Chih Wu President, National Taiwan Normal University ➤ Prof. Mei-Hung Chiu Project Overseer, Professor, National Taiwan Normal University
13:25–13:30	Group Photo
13:30–14:00	Keynote Speech 1 Prof. Jung Sun Kim , Dongseo University, Korea <i>Do Scientists and Engineers Perceive Gender Barriers in STEM?</i> Moderator: Prof. Mei-Hung Chiu, National Taiwan Normal University
14:00–14:30	Keynote Speech 2 Prof. Judy Anderson , University of Sydney, Australia <i>STEM Curriculum Implementation: Impact on Girls' STEM Attitudes and Aspirations</i> Moderator: Prof. Prajval Shastri, Indian Institute of Astrophysics, India
14:30–15:20	Delegates' Presentations <ul style="list-style-type: none"> ➤ Russia Elizaveta Zhdanova, Head of Division for Analytical Support of International Affairs, Far Eastern Federal University <i>Women in STEM: Case of Russia</i> ➤ Malaysia Aizatul Adzwa Mohd. Basri, Head of Assistant Director, Ministry of Education, Malaysia <i>STEM Initiative in Malaysia</i> ➤ Philippines Cynthia Gayya, Senior Science Research Specialist, Science Education Institute, Department of Science and Technology <i>S&T Capacity Building Efforts with Gender Perspective: Philippine Experience</i> ➤ Vietnam Prof. Anh Vinh Le, Acting General Director, The Vietnam Institute of Educational Sciences, Ministry of Education of Vietnam <i>STEM Education in Vietnam: Views from the Social Gap and Gender Issues.</i> Moderator : Prof. Fang-Ying Yang, National Taiwan Normal University
15:20–15:40	Break
15:40–16:10	Keynote Speech 3 Prof. I-Jy Chang , National Taiwan Normal University <i>The Impact of Guaranteed Quota for Female Students in Advanced STEM Studies</i> Moderator: Dr. Fun Man Fung, National University of Singapore, Singapore

16:10–16:40	Keynote Speech 4 Prof. Merrilyn Goos , University of Limerick, Ireland <i>Addressing the Gender Gap in STEM: Lessons from International Research</i>
	Moderator: Prof. Rachel Mamlok-Naaman, The Weizmann Institute of Science, Israel
16:40–16:45	Closing Remarks ➤ Prof. Mei-Hung Chiu , National Taiwan Normal University

Time	26 th March, 2021
08:30–09:00	Registration
09:00–09:30	Keynote Speech 5 Prof. Joseph Krajcik , Michigan State University, USA <i>Supporting All Learners to Use Knowledge to Make Sense of the World</i>
	Moderator: Prof. Mei-Hung Chiu, National Taiwan Normal University
09:30–10:00	Keynote Speech 6 Prof. Tang Wee TEO , National Institute of Education, Singapore <i>Gender Inclusivity in STEM Education: Implications for Curriculum and Teacher Education</i>
	Moderator: Prof. Kuen-Yi Lin, National Taiwan Normal University
10:00–10:50	Delegates' Presentations ➤ Chile Georgina Gutiérrez, Electrical Engineering and Academic, Universidad de La Frontera <i>Closing Gender Gaps in Engineering</i> ➤ USA Patti Curtis, Robert Noyce/Ellen Lettvin STEM Education Fellow, U.S. Department of Education <i>Females in U.S. STEM Education</i> ➤ Mexico Carlos Jesahel Vega Gómez, Head of the Department of Basic and Applied Sciences, University of Guadalajara <i>The Participation of Upper-level Students in the Diffusion and Scientific Development</i> ➤ Peru Milagros Rojas, Science and Technology Specialist and Leader of the Teacher Evaluation Direction of the Peruvian Education Ministry, Education Ministry of Peru Republic <i>Development in the National Educational Proposal for the Area of Sciences in Peru</i>
	Moderator: Prof. Ying-Shao Hsu, National Taiwan Normal University
10:50–11:50	Panel: Supporting Women and Girls in STEM-Plus ➤ Prof. Silvina Ponce Dawson University of Buenos Aires, Argentina <i>Introducing the Gender Perspective into STEM Education</i> ➤ Prof. Sheau-Wen Lin National Pingtung University <i>Pre-service Elementary Female Teachers' Beliefs of and Attitudes toward STEM Education</i> ➤ Prof. Mariko Ogawa Center for Gender Equality Promotion, Tohoku University, Japan <i>Gender Gap in STEM Fields in Japanese Academia : Challenges and Opportunities</i> ➤ Prof. Chia-Li Wu Tamkang University <i>Networking of Asia Pacific STEM Women</i>
	Moderator: Prof. Shiang-Yao Liu, National Taiwan Normal University
11:50–12:00	Closing Ceremony ➤ Prof. Mei-Hung Chiu , National Taiwan Normal University

Keynote Speakers



Keynote Speaker 1

Prof. Jung Sun Kim

Jung Sun Kim has held various leadership positions in academia, government committees and nongovernmental organizations. She is the first woman to be appointed Vice President at her university and one of the few female leaders in higher educational institutions in her region. As a medicinal chemist, she has published over 50 papers in internationally peer reviewed journals and teaches chemistry related courses at her university. Her current work focuses more on academic administration and policy research on women in STEM. She was Director of the Busan, Ulsan Gyeongnam Institute for Supporting Women in Science and Technology (BIS-WIST), a Ministry of Science commissioned center, from 2009 to 2011; she developed the ‘small group support’ program which was to encourage the formation of small size networks among women in STEM. She has been involved with INWES activities since 2003 as a volunteer at first and then being elected to the Board of Directors in 2011, 2017 and again in 2020. She played a leading role in the formation of APNN, the first regional network of INWES in 2011; she prepared the policy manual and the template for the country reports of APNN. From 2014, she and her colleagues have initiated the international collaborative survey among APNN members; an annual report on the perception of gender barrier together with global gender indices have been published, 2014 to 2018. In April, 2019, she was conferred the Order of Science and Technology (Woongbi Medal) by the Korean government for her contribution to the international activities for women in STEM and to the national advancement of women in STEM.

Keynote Speech 1

Do Scientists and Engineers Perceive Gender Barriers in STEM?

Prof. **Jung Sun Kim**, Vice President of Dongseo University, Korea

Abstract

Gender gap in STEM (science, technology, education and mathematics) has persisted throughout the world leading to underrepresentation of women in science and engineering related fields. Korea has been no exception where fully trained and able women in STEM have faced barriers from the entry level of their career opportunities. Although Korea is top ranked among OECD countries in secondary and tertiary education and even though there has been a marked increase in university enrollment of girls in science and engineering fields, the percentage of women in these workforce still remain low. The obstacles may be related to male-dominant culture, stereotypes, and personal and professional life conflicts. However, considering the nature of science and engineering being objective and neutral, would these also apply in STEM fields? Unfortunately, studies have carefully revealed that despite the rationality expected among scientific activities, gender biases do exist. They were a reminder that the environment surrounding the scientists or engineers were not gender barrier proof. Results of a recent international collaborative study among members of the INWES (International Network of Women Engineers and Scientists) Asia and Pacific Nations regional network has shown that women and men perceive gender barriers differently, regardless of age. The implications of these results will be outlined within the framework of gender mainstreaming.



Keynote Speaker 2

Prof. Judy Anderson

Judy Anderson is *Associate Professor in Mathematics Education*, a member of the Academic Board, coordinator of the secondary mathematics curriculum program, and until recently, she was *Director of the STEM Teacher Enrichment Academy* at the University of Sydney. The STEM Academy was developed in 2014 in collaboration with academics from the Faculties of Science, and Engineering. It is an innovative professional learning program for STEM teachers and has reached over 1200 teachers from 220 primary and secondary schools. With a postdoctoral research fellow, Judy has been conducting research into the outcomes of the Academy on teachers' beliefs and practices and students' attitudes and aspirations in STEM. She is currently secretary of the International Group for the Psychology of Mathematics Education (IGPME). She has presented papers at local and international research conferences and has published widely in research and teacher education journals. She is currently co-editing publications on integrated STEM education research and a review of Australasian research. Prior to her role at the University, Judy developed mathematics curriculum in NSW, and provided advice on the implementation of the first Australian mathematics curriculum in 2012.

Keynote Speech 2

STEM Curriculum Implementation: Impact on Girls' STEM Attitudes and Aspirations

Assoc. Prof. **Judy Anderson**, Director STEM Teacher Enrichment Academy,
the University of Sydney, Australia

Abstract

Established in 2014, and the first of its kind in Australia, the *STEM Teacher Enrichment Academy* offered through the University of Sydney brings together teams of science, mathematics, and technology teachers from selected high schools and generalist teachers from primary schools for a five-day program to support and enhance teachers' pedagogical and content knowledge in the development of interdisciplinary units and projects in STEM. The main aim of the Academy is to improve student attitudes and aspirations in STEM, particularly for those underrepresented in STEM university programs and in STEM careers, through increasing teacher capacity in the development of STEM curriculum specific to each school's context. During the program, school teams engage in a year-long mentorship relationship with university staff to support the development of their school-based STEM initiatives. This presentation focuses on the development and impact of STEM programs in a small sample of all-girls high schools, coeducation high schools, and coeducational primary schools. The findings are based on case-study design research using units of analysis of school demographics, school leadership, teachers, students, and STEM curriculum, and presents key characteristics with potential to establish a STEM culture centred upon growth and success for young women in STEM.



Keynote Speaker 3

Prof. I-Jy Chang

I-Jy Chang is a Professor in Chemistry at National Taiwan Normal University. In addition to her academic research, Professor Chang has dedicated to Chemical education for gifted students and to promote female students in STEM education. She has been a long term mentor for the national team to participate International Chemistry Olympiad (IChO, a competition among high school students). She also involved in the organization of the IChO. During 2017-2018, she served as the Chair of the Steering Committee for IChO. Professor Chang incorporated many IChO tasks into Inquire based tasks to stimulate and challenge gifted students. She believes that female students need more encouragement in STEM study, therefore, she initiated the “Reserved quota” for female students in advanced STEM education. That has shown positive results in recruiting talented female students in STEM field. I-Jy was a visiting professor in Yamagata University, Japan in 2015 and 2019. She was invited to Saudi Arabia to teach their gifted students since 2013. I-Jy has received her Ph. D. from Michigan State University in Chemistry in 1988.

Keynote Speech 3

The Impact of Guaranteed Quota for Female Students in Advanced STEM Studies

Prof. **I-Jy Chang**, National Taiwan Normal University

Abstract

Due to the low participation of the female students in STEM studies in high school level, many advanced STEM programs provide guaranteed quota for female students in the last decade in Taiwan. These advanced programs include the selection for delegation for various International Olympiad competition such as Math, Chemistry, Physics, Biology, Earth Science and Information and special Science classes that offers accelerated STEM education. Guaranteed quota definitely promoted the participation. The application from female students increased more than 10%. Interestingly, many admitted female students had test score so high that they would be admitted without the Guaranteed quota. Yet, without the guaranteed quota, they don't bother to apply. The performance of these female students were followed for the entire duration of the program. The results were mixed. Many students showed dramatic progresses, but some didn't perform well. Detail analysis is ongoing and will be discussed.



Keynote Speaker 4

Prof. Merrilyn Goos

Merrilyn Goos is Professor of STEM Education and Director of EPI*STEM, the National Centre for STEM Education, at the University of Limerick, Ireland. Before taking up this position she worked for 25 years at The University of Queensland, Australia, in a range of academic roles including Head of the School of Education and Director of the University's Teaching and Educational Development Institute, working with all Faculties and disciplines to improve the quality of teaching and learning in the University. Previously she taught mathematics, chemistry, and food science in secondary schools and technical colleges in Australia, following her first career as a food technologist working in research and development for a large dairy foods company.

Keynote Speech 4

Addressing the Gender Gap in STEM: Lessons from International Research

Prof. **Merrilyn Goos**, Director of EPI*STEM, the National Centre for
STEM Education, University of Limerick, Ireland

Abstract

It is common to define the “gender gap” in the STEM disciplines in terms of participation and performance in education and careers. However, it is also important to be aware of other, more subtle, gender-based differences in the perceptions, experiences and aspirations of females in the STEM domains. There are many factors that can explain females’ disadvantage in STEM. Moreover, these factors operate at multiple levels – individual, family, school, and society – and they interact in complex ways. From 2017-2019 the International Science Council funded a research project investigating the gender gap in STEM. The aim of the project was to collect and analyse data on the gender gap and to create a database of good practices for encouraging girls and young women to study and pursue education and careers in the mathematical, computing, and natural sciences. In this presentation, I will draw on my work in the Gender Gap in STEM project and other recent research to explain the nature of the gender gap problem and effective approaches to addressing it. I will give examples of initiatives that teachers and schools can take to help address the gender gap problem, while also the need to change STEM education structures, practices and the representation of STEM in wider society, that create barriers to gender-balanced participation and positive experiences for females.



Keynote Speaker 5

Prof. Joseph Krajcik

Joseph Krajcik serves as director of the CREATE for STEM Institute and is the Lappan-Phillips Professor of Science Education at Michigan State University. In his role as director of CREATE, he works with faculty, teachers and researchers to improve the teaching and learning of science, mathematics and engineering kindergarten through college by engaging in innovation and research. Throughout his career, Joe has focused on working with science teachers to design and test learning environments to reform science teaching practices and to research student learning and engagement in project-based learning environments. He has authored and co-authored books, over 100 manuscripts and curriculum materials. Joe served as president of the National Association for Research in Science Teaching from which he received the Distinguished Contributions to Science Education Through Research Award in 2010. In 2014 he received from Michigan Science Teachers' Association the George G. Mallinson Award for overall excellence of contributions to science education. He was honored to receive a Distinguished Professorship from Ewha Woman's University in Seoul, South Korea in 2009, Guest Professorships from Beijing Normal University in Beijing, China in 2002 and 2018, and the Weston Visiting Professor of Science Education from Weizmann Institute of Science, Israel in 2005. He spent 21 years at the University of Michigan before coming to MSU in 2011. Joe received his Ph.D. in Science Education from the University of Iowa in 1986.

Keynote Speech 5

Supporting All Learners to Use Knowledge to Make Sense of the World

Prof. **Joseph Krajcik**, Director of the CREATE for STEM Institute,
Michigan State University, USA

Abstract

How can we support all learners regardless of race, social economic status, and gender to develop usable knowledge of science and social and emotional learning? The need for today's youth to develop an understanding of scientific ideas and science practices is unquestionably more crucial than at any other period in modern history. The rising demand for learners to use their knowledge to make sense of phenomena and solve complex problems falls only a few years after the global scientific and policy communities raised serious concerns for reforming traditional science learning and instruction. In this presentation, I will present a model for designing teacher and student materials and associated professional learning to support all learners in developing useable knowledge. Anchored in what is known to promote learning and the principles of project-based learning with its focus on having students investigate questions that they find meaningful and that are also aligned with critical academic and social and emotional learning goals, our curriculum materials and professional learning have transformed classrooms to places where students work together to generate knowledge and solve meaningful problems. I will share the results of two recently completed randomized clustered efficacy studies, one at the high school level and one at the elementary level, that present convincing evidence of the value of engaging all learners in the doing of science. What is particularly noteworthy is that main effects for these two efficacy studies hold for students of differing reading abilities, gender, and school level race, ethnicity, and SES.



Keynote Speaker 6

Prof. Tang Wee TEO

Tang Wee TEO is an Associate Professor in the Natural Sciences and Science Education (Academic Group) in the National Institute of Education. She is also the Co-Head of the Multi-centric Education, Research and Industry STEM Centre. Tang Wee is a social equity scholar in science education. She applies a critical lens to examine diverse equity issues in science education that affect learners (e.g., science learners with special education needs, lower track students, children aged 6-8, and international students) who are underrepresented in the local and international literature. She has more than a decade of teaching and research experience in STEM teaching and learning, specifically, critical studies of STEM education. Her current work focuses on special education needs science learners and lower track science students. As a trained chemist and chemistry education professor, she also actively publishes in chemistry education journals.

Keynote Speech 6

Gender Inclusivity in STEM Education: Implications for Curriculum and Teacher Education

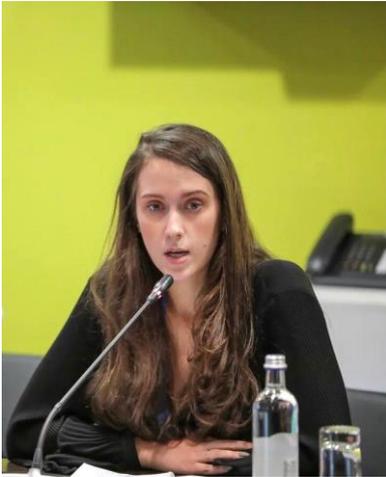
Assoc. Prof. **Tang Wee TEO**, Co-Head, Multi-centric Education,
Research and Industry STEM Centre, National Institute of Education, Singapore

Abstract

There have been widespread efforts to promote gender equity across diverse sectors including the workplace and education. The United Nations has made gender equality the fifth sustainable development goal. More recently, the UN has underscored the increasing real and potential risks of violence against women and girls with the advent of the COVID-19 pandemic. This underscores the necessity of continuous efforts to advocate for greater gender inclusivity in education. STEM (science, technology, engineering and mathematics) education is not a panacea to all the challenges that women confront, but it can afford opportunities for some of these challenges to be addressed. In my talk, I shed light on some nuanced insights drawn from several studies that I have done in the U.S. and Singapore to shed insights on possible reasons why women or girls may not want to pursue a STEM career or stay in the STEM fraternity. Specifically, I will discuss my findings from a case study of a minority woman in STEM in the U.S., and an evaluation study of a STEM programme for girls in Singapore. I reflect on the work that I have done over the past decade to suggest recommendations for curriculum design and teacher education that promote greater gender inclusivity in STEM education.

Delegates

(in the order of presentations)



Russia

Elizaveta Zhdanova

Head of Division for Analytical Support of International Affairs, Far Eastern Federal University

Presentation Title: Women in STEM: Case of Russia

Biography: Elizaveta Zhdanova was granted MSc in International Relations, and is the Head of Division for Analytical Support of International Affairs, Far Eastern Federal University. She is the member of the Executive Board of Far Eastern Association of Russian Language and Literature' Educators and previously worked at Russkiy Mir (Russian World) Foundation, non-governmental organization aimed at promotion of Russian language and culture abroad. She also coordinated the 9th APEC Conference on Cooperation in Higher Education (APEC CCHE'20) "The New Era of Digital Education: Multilateral Approach and Challenges for APEC" supported by the APEC Human Resources Development Working Group and organized a key educational program conducted at Far Eastern Federal University in 2020 BRICS Educational Internship Program. She has participated in large-scale international events such as Russkiy Mir Assembly and BRICS Civil Forum and the author of scientific papers in the fields of BRICS, international cooperation, network diplomacy. She is engaged in women's agenda.



Malaysia

Aizatul Adzwa Mohd. Basri

Head of Assistant Director, Ministry of Education, Malaysia

Presentation Title: STEM Initiative in Malaysia

Biography: Aizatul Adzwa Mohd. Basri spent twelve years teaching Science, Chemistry and Additional Science at secondary schools before joining the Curriculum Development Centre (CDC), Ministry of Education, Malaysia at the end of 2001. She is currently the Head of Deputy Director in the Science and Additional Science Unit in the Curriculum Development Division (CDD), Ministry of Education Malaysia and is responsible for the development of the Science and Additional Science curriculum for secondary schools. She has vast experience in developing curriculum, producing learning materials, conducting courses, carrying out research as well as managing educational programmes. She has also been involved with UNESCO's Girls in STEM programme especially in developing a resource pack for gender responsive STEM education.



Philippines

Cynthia Gayya

Senior Science Research Specialist, Science Education Institute, Department of Science and Technology

Presentation Title: S&T Capacity Building Efforts with Gender Perspective: Philippine Experience

Biography: Cynthia Gayya is a science education advocate having been involved in capacity-building projects of the Science Education Institute, Department of Science and Technology. She leads a teacher training program called Science Teacher Academy for the Regions (STAR) that conducts STEM teacher trainings all over the country. She believes that the quality of students is greatly influenced by the quality of science and mathematics teachers. With this thought, she is very passionate and committed in bringing to a much higher level the competence and knowledge of science and mathematics teachers through teacher trainings. Aside from capacity-building activities, she is also deeply involved in networking activities where she collaborates with science education experts locally and globally for research and information exchange. Her other involvement is with the gender and development activities of the Institute. She has been the chairperson of the Technical Working Group of the Gender and Development (GAD) focal point system of the Institute from 2014-2017 where she was exposed to various GAD mainstreaming activities and a contributor to the Institute's GAD Framework 2017-2020, detailing GAD plans, program and activities of the Institute.



Vietnam

Prof. Anh Vinh Le

Acting General Director, The Vietnam Institute of Educational Sciences, Ministry of Education of Vietnam

Presentation Title: STEM Education in Vietnam: Views from the Social Gap and Gender Issues.

Biography: Prof. Anh Vinh Le is Acting Director General of Vietnam Institute of Educational Sciences (VNIES) and the Director of National Center for Sustainable Development of General Education Quality. Vinh got his B.Sc. in Math (with Honors) and Computer Science from the University of New South Wales, Australia in 2005 then pursued his PhD in Mathematics at Harvard University in 2010. Before joining VNIES, he held several positions at University of Education, Vietnam National University, including Dean of Faculty of Teacher Education, Director of Center for Educational Research and Applications, and Principal of High school of Educational Sciences. He has published more than 60 papers at international journals (both in Math and Education) and is leading a research group at Vietnam Institute of Educational Sciences on developing Vietnam Educational Strategy Framework 2021 - 2030.



Chile

Georgina Gutiérrez

Electrical Engineering and Academic, Universidad de La Frontera

Presentation Title: Closing Gender Gaps in Engineering

Biography: Georgina Gutiérrez is an Electrical Engineer, graduated from “Santiago de Chile” University (USACH). She also has an incomplete a PhD in Engineering Sciences at “Concepción” University, Chile (UDEC). She has a diploma in University Teaching awarded by UFRO and Certification Program for an International Engineering Educator (IGIP-Internationale Gesellschaft für Ingenieurpädagogik- International Society for Engineering Education). She is currently an academic of the Department of Electrical Engineering, Head of Teacher Development and STEM Team Leader, of the Faculty of Engineering and Sciences of the “La Frontera” University, where she performs teaching, research and administrative work



USA

Patti Curtis

Robert Noyce/Ellen Lettvin STEM Education Fellow,
U.S. Department of Education

Presentation Title: Females in U.S. STEM Education

Biography: Patti Curtis is the Robert Noyce/Ellen Lettvin STEM Education Fellow. Through this fellowship, she supports the Department of Education’s STEM efforts and work in collaboration with other Federal agencies. Curtis was selected for the fellowship due to her extensive background working on informal and formal STEM policies and programs. She has served as the Director of the Washington, D.C. Office of the Museum of Science, on the U.S. House of Representatives STEM Education Caucus Steering Committee, the ASTC Public Policy Committee, and the Title IV, Part A Coalition Steering Committee. Previously, she was a government relations representative for the American Society of Mechanical Engineers and served as a leader of the STEM Education Coalition. Curtis is one of the Department of Education’s foremost experts on STEM education and STEM policy and will contribute to an insightful dialogue about the status of STEM and women in STEM in the United States.



Mexico

Carlos Jesahel Vega Gómez

Head of the Department of Basic and Applied Sciences,
University of Guadalajara

Presentation Title: The Participation of Upper-level Students in the Diffusion and Scientific Development

Biography: Carlos Jesahel Vega Gómez is a Communications and Electronics Engineer, a Master in Education with Intervention in Educational Practice and a Doctor in Water and Energy. For 15 years he has been a professor in the area of engineering and basic sciences. At the University of Guadalajara and at the Industrial Technical Teaching Center, in administrative positions he has been Coordinator of the Career of Electronics and Computer Engineering, Head of the Department of Technological Studies, Coordinator of Learning Technologies, Secretary of Division of Engineering, Coordinator of the Doctorate in Water and Energy and is currently the Head of the Department of Basic and Applied Sciences of the University Center of Tonalá of the University of Guadalajara. In the productive sector he has worked in the Information and Communication Technologies sector, being the State Liaison of the National Coordinating Instance in the “Proyecto México Conectado” of the Ministry of Communications and Transportation.



Peru

Milagros Rojas

Science and Technology Specialist and Leader of the Teacher Evaluation Direction of the Peruvian Education Ministry, Education Ministry of Peru Republic

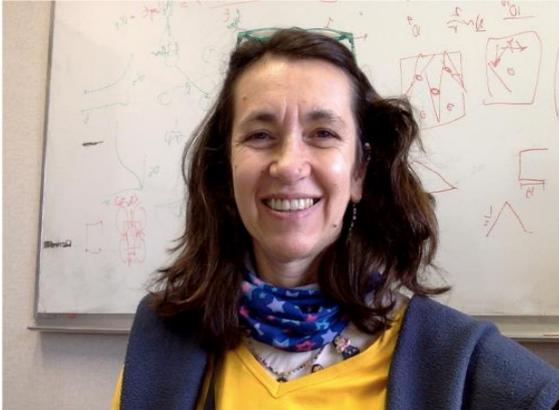
Presentation Title: Development in the National Educational Proposal for the Area of Sciences in Peru

Biography: Milagros Rojas is the doctor candidate in Psychology from the Universidad Nacional Mayor de San Marcos. She graduated with the doctorate in Education and the master in Education Management. She graduated in Human Psychology and in Education in the specialty of Biology and Chemistry. Her postgraduate studies was in Neuropedagogy, attention to diversity, intervention with Special Education People, ICT and teaching of Natural Science. She has represented the country internationally with ICT integration projects in the educational field.

Nominated Delegates for Participation

First Name	Last Name	Organization	Economy
Irene	Gomez Jimenez	University of Guadalajara	Mexico
Clara	Fiestas Salinas	Education Ministry of Peru Republic	Peru
Carmen	Yupán	Education Ministry of Peru Republic	Peru
Angela	Pinedo	Education Ministry of Peru Republic	Peru
G.H.	Ambat	Department of Education	Philippines
April	Valdez	Science Education Institute, Department of Science and Technology	Philippines
Ruby Caroliza	LAÑ A	Science Education Institute, Department of Science and Technology	Philippines
Lorvi	Pagorogon	Philippine Science High School-Bicol Region Campus	Philippines
Louie	Jamora	Philippine Science High School-Zamboanga Region Campus	Philippines
Yann Shiou	Ong	National Institute of Education, Nanyang Technological University	Singapore
Timothy Ter Ming	Tan	National Institute of Education, Nanyang Technological University	Singapore
Ashley	Clark	U.S. Department of Education	USA
Aaron	Neumann	Leed Management Consulting	USA
Duc Lan	Do	National Center for Sustainable Development of General Education Quality, The Vietnam Institute of Educational Sciences, Ministry of Education of Vietnam	Vietnam

Panelists



Panelist 1

Prof. Silvina Ponce Dawson

Silvina Ponce Dawson is the full professor of the University of Buenos Aires (UBA), the superior researcher of Argentinian National Research Council (CONICET), and the acting president of International Union of Pure and Applied Physics (IUPAP). Also, She is the senior associate of International Centre for Theoretical Physics (ICTP) of Trieste and associate editor of Editorial Board of Biophysics for Frontiers. She was Chair (2005-2009) of the Physics Department, UBA. Her main research interests are in biological and statistical physics and nonlinear dynamics. For the last 20 years she has been involved in numerous activities to help reduce the gender gap in physics and in science. She was Latin American representative (2007-2011) and Chair (2011-2014) of the Working Group on Women in Physics of the IUPAP and Vice-President at Large with Gender Champion duties (2017-2019). She is member of the Executive Committee of the Gender Gap in Science Project and coordinator of its Latin American chapter. She co-edited with Lilia Meza Montes of Puebla, Mexico, a book on the gender gap in STEM in Latin America. She is member of the Network of Gender, Science and Technology and of the advisory committee for the Program on Gender Equality of the Argentinian Ministry of Science. She is mother of two and grandmother of another two.

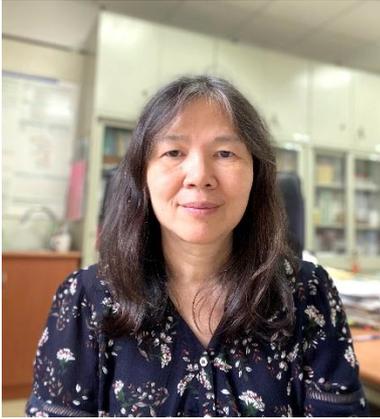
Presentation 1

Introducing the Gender Perspective into STEM Education

Prof. Silvina Ponce Dawson, University of Buenos Aires, Argentina

Abstract

The fraction of women with access to higher education studies has increased steadily for a long time now. This growth, however, has not occurred at the same pace in all disciplines. In particular, women are under-represented in many STEM fields in most countries. Women in research institutions, on the other hand, are usually not as well recognized as their men colleagues affecting the advancement in their careers and their visibility. All these aspects reinforce gender stereotypes that not only affect career choices but also have a direct influence on students' performance at all levels. Gender stereotypes are quite pervasive across societies and are still present in textbooks and in the teaching process. Raising awareness is a necessary step to reduce these stereotypes. In this talk I will briefly describe some pathways that can be followed to make STEM education more inclusive. In particular, I will discuss our experience in Latin America with the workshops on professional development with a gender perspective that we are seeking to incorporate formally into PhD programs. This experience could be replicated in teacher education institutions and, in this way, contribute to the full development of people of all genders and backgrounds in STEM fields.



Panelist 2

Prof. Sheau-Wen Lin

Sheau-Wen Lin has over 25 years' experience in science education, teaching at tertiary levels, and being involved in science teacher education in Taiwan. She is Academic Vice President at the National Pingtung University(NPTU), and is responsible for the development and implementation of STEM courses for both undergraduates and postgraduates at the university. Her key competencies lie in the following areas:

- STEM Education for Elementary Teachers and Students
- Elementary Science Teacher Education
- Science Language Learning
- Students' Misconceptions of Science

She has shared her insights in STEM learning and teaching on various occasions in Taiwan and at international conferences. She had served as President of Association of Science Education in Taiwan and Vice president of East-Asia Association for Science Education. She is an author or co-author of several books on STEM education, published by NPTU. She has a B.A., an M.A., and a Ph.D. in Science Education.

Presentation 2

Pre-service Elementary Female Teachers' Beliefs of and Attitudes toward STEM Education

Prof. Sheau-Wen Lin, National Pingtung University

Abstract

STEM, the integration of science, technology, engineering and mathematics, plays a vital role in fostering competitiveness and sustainable economic development. Although female students match or outperform their male counterparts in math and science in both elementary and secondary school, a gender gap has appeared in STEM-related fields. Female teachers make up a big percentage in the elementary education level and their role models have more effect on female students with STEM-related career expectations and learning motivation. To support and empower pre-service elementary female teachers to teach STEM, it is needed to understand their beliefs and attitudes for implementing STEM education into practices. For exploring the beliefs of and attitudes toward STEM education, a questionnaire was adopted and administered to female pre-service elementary teachers in four Asia countries—Japan (n =98), Korea (n =189), Taiwan (n =222), and Thailand (n =238). The validation went through exploratory factor analysis. Descriptive statistics of four dimensions were displayed and *t*-test or analysis of variance were used to test the significantly different level of dimensions from different groups. The results indicated that the participant teachers from four countries had positive responses on the attitudes toward STEM teaching and learning. But they were less confident in STEM teaching. It seemed that the gender gap existed in some of the four countries. These results provided important implications for teacher educators to consider female pre-service teachers' beliefs and attitudes and provide them with various STEM leaning opportunities to empower them to teach STEM.



Panelist 3

Prof. Mariko Ogawa

Mariko Ogawa is an Associate Professor of the Center for Gender Equality Promotion at Tohoku University. She is specializing in sociology and law, gender studies, and women’s leadership. Her research interests include gender equality policy, domestic violence, and women’s leadership in higher education and STEM field. Her publication, “Domestic Violence to Minkan Shelter” (Domestic Violence and Women’s Shelters, 2015, Japan, Seori Shobo), received the Raicho Hiratsuka Prize from Japan Women’s University, Tokyo, Japan. Her co-authors publication is “Japanese Women in Leadership” (Palgrave Macmillan, in print). Dr. Ogawa holds a Bachelor of Arts Degree in Economics from University of California, Los Angeles. She received her master’s degree in Social Science and her doctorate in Social Science and Gender Studies from Ochanomizu University in Tokyo. She has previously trained female employees at a Japanese bank and worked as a researcher at the Gender Equality Bureau, Cabinet Office, Government of Japan. After receiving her doctorate, she worked at Center for Leadership Education and Research of Ochanomizu University, and as a Post-Doctoral Research Fellow at the Japan Society for the Promotion of Science, as an Associate Professor of Office for the Promotion of Gender Equality at Kyushu University in Japan.

Presentation 3

Gender Gap in STEM Fields in Japanese Academia : Challenges and Opportunities

Prof. Mariko Ogawa, Center for Gender Equality Promotion,
Tohoku University, Japan

Abstract

About 100 years ago, the argument for opening the door of higher education to women increasingly gained attention in Japan. In 1913, three females in STEM fields were finally admitted to a former imperial university, which had previously been a prerogative of male students. Tohoku Imperial University, which had just been established in 1907, broke with tradition and welcomed females into its classes. Two out of three female students received their doctoral degrees in chemistry and became pioneering female scientists and played active roles. The opening of universities to women was a major stepping-stone for their participation in Japan's higher education. This trend has had an impact on the development of female researchers. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has implemented various programmes over the past 10 years to increase the number of female students entering STEM fields and female researchers. Tohoku University has also adopted the MEXT's programmes and is working to support female researchers. However, while more than 80% of the members are in STEM fields, the percentage of female students in doctoral programmes is only 30.7% and the percentage of female faculty members is only 16.9% as of 2020. On the other hand, Tohoku University is the pioneering university in Japan to train female doctoral students in STEM fields, and they are serving as role models for elementary, junior high and high school students. In this presentation, I will draw on Tohoku University's unique programmes and factors that hinder the increase of number of female researchers, including the issue of unconscious bias.



Panelist 4

Prof. Chia-Li Wu

Chia-Li Wu has been participating women's groups for women's rights and gender equity education since early 1980s in Taiwan. She was once on leave for 6 years to take a government position in a Standing Commission of Examination which is supervising all national exams for screening civil servants and policies related to civil service. She was a Principal Investigator in many liverwort and gender & science projects. She is the founding President (2011/11-2015) of the Society of Taiwan Women in Science and Technology (TWiST). She had also been a board director of INWES (2015-2020, International Network of Women Engineers and Scientists) and Chair of INWES-APNN (2018-2020, Asia Pacific Nation Network). In 2008, she initiated the publication of a monthly e-Journal for Taiwan Women Scientists to build a network among them. Now the e-Journal has been expanded to a new form as "**Taiwan Women e-Press**" by younger women scientists. She obtained her PhD from the University of Washington, Seattle, her MS from the University of Wisconsin-Milwaukee and her BS from National Taiwan University.

Presentation 4

Networking of Asia-Pacific STEM Women

Prof. Chia-Li Wu, Tamkang University

Abstract

Asia Pacific Nation Network (APNN) is a regional branch of International Network of Women Engineers and Scientists (INWES). The 1st APNN Meeting was held in Adelaide, Australia, 2011 with delegates from 12 Asia-Pacific countries. Since then, members take turn to hold APNN meetings of 2-3 days every year. The network is to serve as a platform for Asia-Pacific women scientists and engineers to exchange information, gender policies and current situation in every member country. We now have either individual members or organizational members from 16 countries in APNN. Other than APNN meeting and conference held annually, the NGO member from each country may invite STEM women from other member countries to join their own country's activities. We also do regular surveys on gender issues among member countries and publish the results afterwards. INWES (<https://www.inwes.org/>) was founded in 2005, originally to oversee ICWES, the international conference held every 3 years since 1964. INWES now has 4 branches—APNN, ARN, Europe, and MENA now. In-between the year of ICWES, we also have regional conferences which are good opportunities for members' networking as well. INWES is an official NGO partner of the operational type with UNESCO and has consultative status with ECOSOC of UN. With this partnership and status, INWES and its members involve dynamic cooperation to help women and girls worldwide to access education, especially in science and engineering.

