



# MEASURING GENDER BARRIER PERCEPTIONS

**Jung Sun Kim, Ph.D.**

President 2021-2023, INWES

Executive Vice President, Dongseo University, Busan, South Korea

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# International Network of Women Engineers & Scientists

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INWES is a global network of organizations of women in STEM, with Organizational Members, Corporate Members, University Members, and Individual Members, all together representing about 250,000 women from over 40 countries worldwide.

*“To build a better future worldwide through full and effective participation of women and girls in all aspects of STEM”*





# **MEASURING THE PARTICIPATION OF WOMEN (IN SPACE SECTOR)?**



# Numbers

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- Women in STEM: a policy issue worldwide since early 2000
  - EU : SHE Figures (1999 proposed pan European statistics on women in STEM, First publication in 2003)
  - US (NSF's "Realizing America's potential" 2000, report in 2003)
    - "Federal Gov't should expand funding for programs that best succeed in graduating underrepresented minorities and women in S&E. .."
  - UNESCO (1999 World Conference on Science → 2004  
Mainstreaming gender issue as top priority identified in International Consultation in S&T Priorities and Information)
- Numbers as "evidence based statistics" for policy & decision making
- Sex –disaggregated indicators can visualize gender disparities



# Numbers measured in various ways

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- Numbers as Indicators, Information, Statistics
- UIS, Eurostat, OECD, WEF, ISC, SAGA (tool kit) etc



# How have the numbers changed?

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- Gender gap is still vivid
- Gender gap varies by nation (eg Korea vs Mongolia), by fields (eg, Biotechnology vs Space technology) and by workplace (eg, industry vs university)
- Fixing the numbers vs Fixing the system (Gender barrier perceived by women themselves)



# **VARIABLES TO BE CONSIDERED**



## Paradox : Gender Equality & STEM

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- Gender Gap in STEM has persisted
- < 30% are Women in R&D in STEM Worldwide: UIS data (2016)
  - 23.9% for East Asia and the Pacific, 18.5% for South and West Asia, but 80% in Myanmar, Thailand
  - Global female enrollment is low in ICT, Physical Sciences, Engineering etc
- Bias and gender stereotypes are driving women away from STEM careers → under-representation of women in STEM
- **But, as societies become wealthier and more gender equal, women are less likely to obtain STEM degrees → the gender equality paradox**



# Why Perception of Gender Barrier?

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- ⑩ Increasing numbers or proportions of women in STEM is NOT enough.
- ⑩ Cultural change including awareness of hidden barriers is needed.
- ⑩ A GISE index can be a “tool for change”



An INWES APNN Collaborative Study on the Perception  
of Gender Barriers in STEM in Asia

# **GENDER BARRIERS IN STEM**



# The APNN Collaborative Study



- APNN was established as the first regional network of INWES in 2011 at ICWES15
- The Study was organized by KWSE, 2014-2018
- Participating Countries : Australia, Bangladesh, India, Japan, Korea, Malaysia, Mongolia, Nepal, New Zealand, Pakistan, Sri Lanka, Taiwan, Vietnam



# **THE GISE SURVEY: MEASURING PERCEPTION**

## **A COLLABORATIVE EFFORT BETWEEN KWSE AND INWES**

**GISE = Gender barrier perceptions In Science &  
Engineering**



# Scope of the 2021 Study

## Purpose:

- ⑩ share statistical data on gender perceptions in the STEM fields
- ⑩ by country, gender and age
- ⑩ **foundation and pilot for developing international indicators on women in STEM and a continued longitudinal study**
- ⑩ play a key role in building a policy road map for the balanced development of future human resources worldwide.

## Targets & numbers





# The Questionnaire

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**Key questions - based on 2018 APNN survey**

**Section B:** Perception of Gender Barriers in STEM

**Sections C/D:** Direct/Indirect Experience of Gender Barriers in STEM (C - female; D - male)

**Section E:** Career outlook for women in STEM and need for Support Policies to combat Gender barriers

**Section F:** Gender Equity and Gender Roles

**Section G:** Gender Barriers in the work, study and research environments in STEM

**Section H:** Respondent's own STEM Career.

= Same languages and using Google Forms



# The Questionnaire

<b>Gender barriers</b>	<b>Perception of discrimination</b>	① Boys are encouraged more than girls to go into the STEM field.
		② It is more difficult for a woman to get a job in the STEM field than for a man even with the same qualifications.
		③ Becoming a tenured professor, being promoted or becoming a principal investigator is more difficult for female scientists than for male scientists.
		④ Women in STEM generally receive less pay for equal work, compared with their equally-qualified male colleagues.
	<b>Experiences of discrimination</b>	① I have experienced disadvantages in leading or participating in research projects because I am a woman.
		② I have experienced disadvantages in receiving research funds or scholarships because I am a woman.
		③ I have experienced sexual harassment or unfair treatments sometime in my career.
		④ Balancing work and life (marriage and family) has been a handicap for me.
	<b>Gender role stereotype</b>	① Primary breadwinners (who take care of financial obligations) of households should be men.
		② Women are born to have a way of caring children that men are not capable of in the same way.
		③ In order to maintain the order and peace of a family, the husband should have greater power and authority than the wife.
		④ In a relative sense, men are rational while women are emotional and thus, they ought to complement each other by doing what is appropriate for themselves.
<b>Career outlook</b>	I believe things will turn out fine in my future career.	
<b>Policy needs</b>	It is crucial to have strong policy support to solve gender inequality in the STEM field.	
<b>Equality concept</b>	I believe gender equality will be fully achieved only if women are given equal opportunities as men.	



# The Questionnaire

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Responses are on the Likert Scale (1-5)

where 1 = strongly agree/experienced

5 = strongly disagree/not experienced

**Section A:** Personal information and circumstances or *confounding variables*

- ⑩ more information on family circumstances (including identifying where caring responsibilities lay)
- ⑩ aspects of socioeconomic backgrounds (e.g., rural versus urban backgrounds)
- ⑩ identification of career stages
- ⑩ and language



# 2021 Responses

	Target	
Responses	1500	1200+
Countries	10	29
Female : Male	50:50	53:47
Bio : Eng : IT (:Other STEM)	33:33:33	25:32:36:9
But these hide imbalances in countries/regions.		

## Phases of Analyses

1. Global comparisons
  - ⑩ Gender
  - ⑩ 3 STEM areas of focus
2. Republic of Korea against all other countries
3. For Korea, India, Europe, Japan, Mongolia:
  - ⑩ Gender
  - ⑩ STEM areas of focus
4. By levels of economic and human development
5. Gender Index proposals



# CHALLENGES AND LESSONS LEARNED



# Perception of Gender Barrier by young scientists in Korea

Question		Score	<i>t</i>	<i>p</i>
Girls and women's education				
Female scientists' access to their research or projects				
Women's career development compared with men				
<b>It is equally difficult for a woman to get a job in the STEM field than for a man with the same qualifications.</b>	female	3.21	3.099	0.002
	male	2.72		
Being promoted or becoming a tenured professor or a principal investigator is equally difficult for female scientists than for male.	female	2.95	1.660	0.098
	male	2.70		
<b>Women in STEM generally receive equal pay for equal work, compared with their equally-qualified male colleagues.</b>	female	3.24	5.273	0.000
	male	2.45		

• **Young Men (born 1988~1998) in STEM tend to feel less the gender barrier that their female colleagues perceive.**  
 • **Young women feel that they are not equally appraised for their work, do not have equal opportunities getting jobs and receive less pay than their male colleagues**



Girls and boys are equally encouraged to choose their majors in STEM during their education period ?

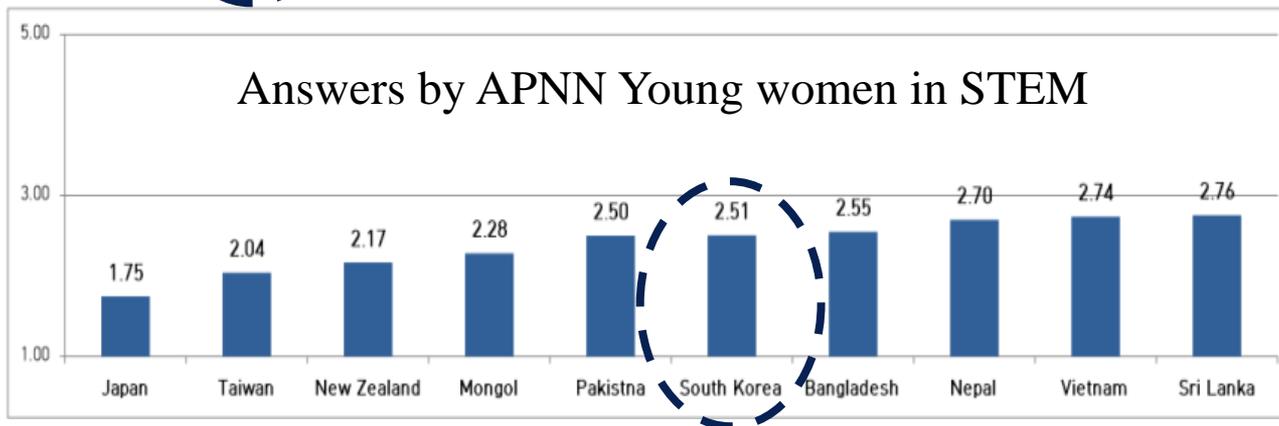
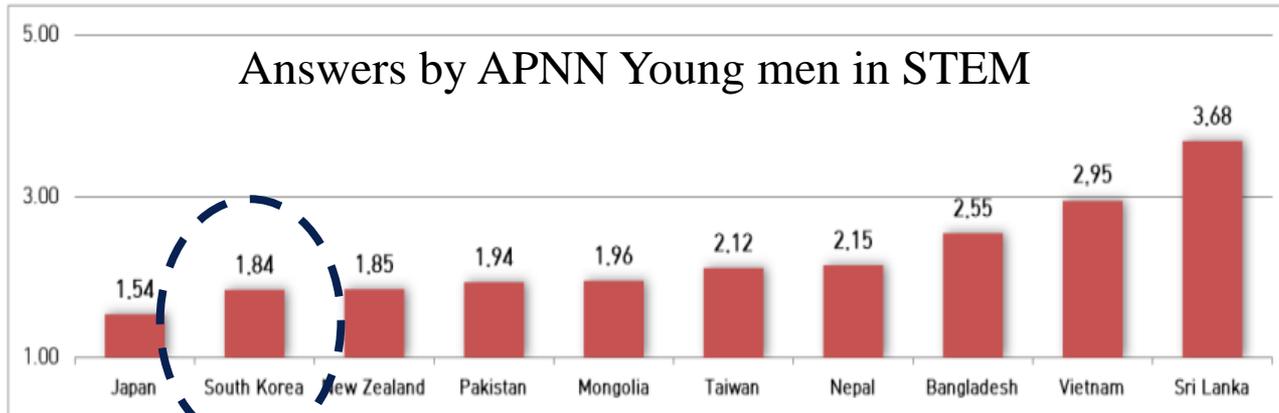
**(Women disagree more than men)**



\*Data from The 2018 Policy Report on Balanced Development of Human Resources for the Future, KWSE (2018)



# Experience of Gender Barrier: Gender Gap



Korean men do not seem to agree with the women on gender barrier experience. (reverse coded)

Overall, except Vietnam, Sri Lanka and Taiwan, women show higher scores on experience of gender barrier than men.



<http://www.inwes.org/gise>

## The 2021 Report on International Perceptions of Gender Barriers in STEM

Outputs and outcomes of the INWES-KWSE Pilot Survey  
"Gender perceptions in Science and Engineering" (GISE)

The International Network of Women Engineers and Scientists (INWES) &  
The Association of Korean Woman Scientists and Engineers (KWSE)





**Bioscientists** disagree more with these statements than engineers and digital technologists.

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**G6** Marriage, pregnancy or childcare have the same effect on scientist/engineer regardless of their gender/sex on their study, research or work performance.

**G5** Women receive the same social evaluation and respect as men in their roles as scientists or engineers (by their colleagues, professor, managers, funding donors, academic association, scientific society, professional institution, etc.)

**H3** I have not been personally affected by gender barriers in STEM.



# GISE index

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- Based on results of survey, GISE index is being developed
- GISE Index could lie anywhere between -1 and 1.
- A value of less than 0 would indicate that men are seeing gender barriers that women are not experiencing; this is a very unlikely although possible situation.



# Challenges

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- ⑩ Areas of STEM focus : the more under-represented?
- ⑩ Data collection for the *confounding variables*
  - ⑩ Age/career stage
  - ⑩ Regional/local confounding variables
- ⑩ Translation
- ⑩ Coding and question numbering
- ⑩ Responses
  - ⑩ Information to disseminators
  - ⑩ Reaching target audiences
- ⑩ Method of distributing the form
  - ⑩ Google not acceptable everywhere



# Thank you!

*“building a better future worldwide through the full participation of women in girls in STEM”*

*<http://www.inwes.org>*