Gender barriers in science and engineering in the Asia and Pacific nations
(Mongolian case study)

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Abstract

The Fourth Industrial Revolution urges countries to think creatively about every aspect of the society including businesses and education. It is alarming that the era of exponential technology possibly will advent new gender gaps especially in developing and underdeveloped countries. A developing country with a very small economy that is dependent mainly on natural resources such as Mongolia needs to foster a rational strategy for prosperity. More than ever, equal contribution of women and men in this process of deep economic and societal transformation is critical.

This study is based on "the 2018 Policy Report on Balanced Development of Human Resources for the Future", Analysis of Global Gender Indices and Joint Survey Results carried out by the Association of Korean Woman Scientists & Engineers jointly with the Asia Pacific Netwok of Nations and African Regional Network Member Countries of International Network of Women Engineers and Scientists.

The study attempts to comparatively summarize the gender equality state of based on Human Development Index, Inequality-adjusted Human Development Index, Gender Development Index and the Global Gender Gap Index and the joint survey 2018 results by Korean Woman Scientists & Engineers.

The study concludes that as a post socialist country, the gender equality issues and its motives can be different in Mongolia than the compared countries. Efforts on policy support and change of gender related social attitudes may require to make progress in gender barriers in STEM.

1. Brief about Mongolian Economy and Gender Equality

After adopting a new constitution in 1992, Mongolia was transformed from a closed single-party Communist state to a dynamic multiparty democracy. This transition has been accompanied by the gradual introduction of free-market reforms and relatively well-maintained political stability. In the 1990s, Mongolia started to attract a noticeable share of the world foreign investment especially in the mining sector by introducing the Mineral Law in 1997, regarded as the world's liberal mineral laws (Narankhuu, 2018). As a result, the mining industry's contribution to the country's total Gross Domestic Product (GDP) tripled just in four years between 2002 and 2006. In 2018, the country's GDP has reached to 13.01 billion US dollars and the mining industry's share in the total export revenues increased dramatically accounting 80 percent.

Despite the shift to a free market economy and the passing of equity legislation, discrimination against women, widened. The wage gap widened across all sectors, with less women working in top positions. Furthermore, the proportion of women elected to national parliament fell from 23% in 1990 to 10% in 2000, 7% in 2004 and increased back to 17.1% in 2016, a trend reflected at all levels of political decision making. Equal rights are guaranteed

under the 1992 constitution supported by a large body of new legislation in economic and social spheres to protect those rights. In practice, however, with few women participating in key decision-making forums, priority is not given to ensuring women can claim their rights or to addressing growing gender gaps in several areas of development (ADB and WB, 2005).

2. Human Development Index by the UNDP

Mongolia is in the group of high human development with HDI value of 0.741 for 2017, positioning in the 92nd out of 189 countries and territories. The rank is shared with Fiji. Between 1990 and 2017, Mongolia's HDI value increased from 0.579 to 0.741, an increase of 27.9 percent. Table 1 reviews Mongolia's progress in each of the HDI indicators. Between 1990 and 2017, Mongolia's life expectancy at birth increased by 9.2 years, mean years of schooling increased by 2.4 years and expected years of schooling increased by 5.3 years. Mongolia's GNI per capita increased by about 114.3 percent between 1990 and 2017.

Table 1: Mongolia's HDI trends based on time series data

Years	HDI value	Life expectancy at birth (years)	Expected years of schooling (years)	Mean years of schooling (years)	Gross National Income per capita (2011 PPP $)
1990	0.579	60.3	10.2	7.7	4,714
1995	0.555	61.2	7.7	7.8	4,311
2000	0.589	62.9	9.4	8.2	4,654
2005	0.650	65.1	12.7	8.6	6,004
2010	0.697	67.4	14.6	9.5	7,105
2015	0.737	69.1	15.0	10.1	10,511
2016	0.743	69.3	15.5	10.1	10,618
2017	0.741	69.5	15.5	10.1	10,103

(Source: UNDP Human Development Report 2017)

Mongolia's HDI for 2017 is 0.741 compared to the 19.3 percent of average loss for the APNN member countries. However, when the value is discounted for inequality, the HDI falls to 0.639, a loss of 13.7 percent due to inequality in the distribution of the HDI dimension indices.

Despite that most of the ARN member countries are classified as the group 5 in the GDI indicating severe gender inequality in human development, the 2017 female HDI value for Mongolia was 0.750 in contrast with 0.733 for males, resulting in a GDI value of 1.023, placing it into Group 1. In comparison, the GDI value of 1.026 placed the country into Group 2 in 2016.

Mongolia has a GII value of 0.301, ranking it 65 out of 160 countries in the 2017 index. In Mongolia, 17.1 percent of parliamentary seats are held by women, and 91.2 percent of adult women have reached at least a secondary level of education compared to 86.3 percent of their male counterparts. For every 100,000 live births, 44 women die from pregnancy related causes; and the adolescent birth rate is 23.6 births per 1,000 women of ages 15-19. Female participation in the labour market is 52.7 percent compared to 66.2 for men.

Mongolia's individual human development is in the group of high human development, however the country needs to improve GNI per capita in order to be able to find in the upper category of HDI. Furthermore, loss in human development due to inequality is quite moderate. Regardless of Mongolia's attainment in GII value which was greatly lowered from from 0.501 in 2000 to 0.316 in 2015, the it is visible that the country still needs to improve on indicators such as maternal mortality, adolescent birth rate and share of seats in parliament which are well

off behind compared to other countries.

3. Global Gender Gap Index by the WEF

According to the World Economic Forum's Global Gender Gap Report 2018, Mongolia ranks 58 out of 149 countries and has an index of 0.714 (0.00- inequality and 1.00- equality). As can be seen from Table 2, Mongolia has been making gradual progress in all areas since 2006 (when the index was 0.682). While the scores for "educational attainment" and "health and survival" have remained relatively high and stagnant for the past years, there has been small progress in "economic participation" (from 0.704 to 0.780) and in "political empowerment" (from 0.046 to 0.102).

Table 2 Gender Gap Index of Mongolia

Years	Overall		Economic Participation		Educational Attainment		Health and Survival		Political Empowerment	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
GGI 2018 (149 countries)	58	0.714	20	0.780	70	0.993	1	0.980	109	0.102
GGI 2017 (144 countries)	53	0.713	20	0.776	65	0.993	1	0.980	107	0.102
GGI 2013 (136 countries)	33	0.720	2	0.834	49	0.995	1	0.980	108	0.073
GGI 2009 (134 countries	22	0.722	1	0.833	1	1.000	1	0.989	100	0.075
GGI 2006 (115 countries)	42	0.682	21	0.704	20	0.999	1	0.980	101	0.046

Source: WEF Global Gender Gap Report 2006, 2009, 2013, 2017 and 2018

4. Survey on Gender Barrier among APNN and ARN Member Countries

Mongolia has been reporting its data to the Gender Barrier Survey conducted by the KWSE through it's organization WSTEM since 2013. In 2018 survey 209 respondents participated which was 13 percent of the total APNN country respondents. The average age of Mongolian respondents was 25.36, amongst the oldest compared to the average age of 24.18 and the youngest from New Zealand (22.03), and the oldest from Japan (24.34). Respondents from engineering backgrounds was 67.5 percent. Majority of those responded were graduate students and/or working with their masters/doctoral degree (49.1 percent) while 40.3 percent were undergraduate students. Among the total number of female respondents in APNN, Mongolia and Japan showed the highest numbers, consisting of 13.92 percent and India the lowest of 0.49 percent.

4.1. Perception of Gender Barriers in STEM (Mongolian participants)

According to the Gender Barrier Survey 2018, the average scores on the Perception of Gender Barriers from Mongolian participants (2.69 for female respondent, 2.65 for male) indicates that respondents overall do not feel that severe discrimination existed. The score for male was higher for all the questions compared with APNN countries except "It is equally difficult for a woman to get a job in the STEM field than for a man with the same qualification" question with 2.65 (APNN average without Mongolia 2.53). This result shows that men perceived more discrimination of women than women themselves on getting a job in the STEM field. Female participants responded with the highest score of 2.99 for the statement, "Women in STEM receive equal work distribution and work appraisal compared to men of the same qualifications and level" followed by 2.87 for "Women in STEM generally receive equal pay for equal work, compared with their equally-qualified male colleagues."

4.2. Experience of Gender Barriers

The average score on Experience of Gender Barriers (2.28 for female and 1.96 for male)

is lower compared for both sexes of APNN average without Mongolia. This indicates that respondents perceive experiences of gender barriers less than the APNN countries. On all of the questions, the scores from female participants were higher than those from male. Similarly to the APNN average, both female (2.85) and male (2.41) gave the highest score for experience of "Women in STEM being in trouble or leaving work due to her marriage, pregnancy or child care have the same effect on scientists/engineers regardless of their sex for their study, research or project performance, pregnancy or child care", followed by 2.38 (female) and 1.96 (male) on "Women in STEM being sexually harassed (linguistical or physical) or treated unfairly by their colleagues (in class, laboratory, project group, etc)."

The question with the lowest score from male respondents among the questions was 1.79 for "Women in STEM being disadvantaged in receiving grade appraisal, research funds or scholarships because they are female", followed by 1.81 "Women in STEM being disadvantaged in accessing research equipment or information because she is female". It has to be noted that scores male respondents from Mongolia were lower than the APNN average in all 6 questions.

For female respondents, same as the male respondents, the lowest scored question was 1.94 for "Women in STEM being disadvantaged in accessing research equipment or information because she is female" followed by 2.08 for "Women in STEM being disadvantaged in receiving grade appraisal, research funds or scholarships because they are female."

The results show that experience of gender barriers are less in Mongolia compared with APNN countries in general. However, similarly with the APNN countries, experience of gender barriers on sexual or biological aspects are more severe compared to those related to research or work.

4.3. Career Outlook for Women in STEM

According to the survey findings, unconventionally, the female respondents are perceived as more optimistic (4.33) and in fact the highest of APNN countries, while the male respondents (3.91) had lower score than the average of APNN without Mongolia (4.06). In all the other APNN countries male respondents were more optimistic than the female respondents of their countries. It is noteworthy that ARN countries in general also had relatively optimistic response in this part with higher score for female (4.41) than male (4.34).

4.4. Need for Policy to Overcome Gender Barriers

The responses to "It is crucial to have strong policy support to solve gender inequality in the STEM field" showed an average of 4.18 for female respondents, which was higher than the APNN average without Mongolia (3.97) and 3.77 for male respondents, which was lower than the APNN average without Mongolia (3.80). Even though the average score is significantly different between female and male respondents, that is female respondents seemed to agree more than male respondents, both scores reflect a high demand for supportive policy. The scores for introducing a quota system or affirmative action plan were 3.99 for female respondents and 3.45 for male respondents which both were higher than APNN average without Mongolia (3.65 and 3.23 respectively). It is noticeable that female young scientists and engineers expressed a strong need for policy to overcome gender barriers and introduce a quota system.

4.5. Perception of Gender Role Stereotype

The average Mongolia response to the four questions was 3.00 for female and 3.22 for male respondents, which are lower than the APNN average without Mongolia (3.54 and 3.22

respectively). The most progressive attitude was found in "Women are born to have a way of caring children that men are not capable of in the same way" with an average of 3.32 (female) and 3.01 (male). Same as the APNN average, the statement "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" received the lowest score at 2.68 from female respondents and at 2.44 from male respondents. This demonstrates that most respondents did not agree on patriarchal power within the family.

4.6. Perception of Gender Equity

The average score from male respondents (2.62) on this statement is significantly higher than that from female respondents (2.13) and both were less than the middle value of 3.0 and less than the APNN average without Mongolia. In other words, both male and female respondents from Mongolia seemed to have weak understanding of gender equity.

4.7. Perception of Gender Barrier for Study and Research Environment

The average score of Mongolia for the seven questions was 2.53 for female and 2.54 for male. Similarly, with the APNN countries, the strongest perception from female respondents was shown in "Marriage, pregnancy or child care have the same effect on scientists/engineers regardless of their sex for their study, research or project performance," with a score of 2.94. For male respondents "Female students in STEM are intimidated in the laboratory or in classes because they are female" had the strongest score of 3.03.

The statement "Women are equally granted or entrusted equal role for their research or project at the laboratory" was scored as the lowest by both female (2.23) and male (2.33) respondents. Overall, the average score female respondents from Mongolia were second highest to Vietnam (2.88).

5. Conclusion

This country report was summarized based on the Human Development Index (HDI), Inequality-adjusted Human Development Index (IHDI), Gender Development Index (GDI), Gender Inequality Index (GII) and global Gender Gap Index (GGI) and Joint Survey Results conducted by the KWSE focusing on the Mongolian gender equality state.

Mongolia is a post-socialist country that has experienced dramatic socio-economic change since 1990s that resulted a tense shock all social aspects of the country. Therefore, it can be considered that the gender equality issues and its motives can be different than the APNN countries.

Nevertheless, Mongolia is in the group of high human development, it is evident that a need for suitable policy to increase GNI per capita and most importantly improvement on the inequality indicators. Regardless of the GII value attainments, Indicators such as maternal mortality, adolescent birth rate and share of seats in parliament which are hindering the country's progress.

The study on Gender Barrier among APNN and ARN Member Countries by KWSE suggests that to some extent, achievements can be seen in gender related issues in the STEM environment. It is contemplated that an experience of gender barriers on sexual or biological aspects are more severe compared to those related to research or work. However, Mongolia needs to make more efforts on support policy and strengthen the understanding of gender equity to overcome the current gender barrier in STEM.

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