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GENDER GAP IN SCIENCE AND TECHNOLOGY

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Abstract

The world has historically experienced with the exclusion of women from science for a long time. Later on, the gender questions in science and technology was extensively raised and the entry of women in science and technology got started. But, the participation of women in Science is still not in parity of expectation. Although the gender gap in science and technology is continuously narrowing down over the years, men still continue to outperform women in scientific experiments and achievements. The negative attitude of women about science and technology remains active due to the influence of socio-psychological parameters. Gender inequality in science and technology can be reduced by proper monitoring, proper informing and creating necessary work conditions in these fields. Gender equality and normal work conditions for both men and women are prime factors for functioning of any normal society and settling the gender inequality in science and technology may strengthen the socio-scientific development.

Keywords: Gender Gap; Women; Science and Technology.

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1. Introduction

The modern day people lives in the era of globalization and rapid technological development. The role of science and technology is extremely important for the contemporary society, which has changed people's lives dramatically. In tune with this, the roles of men and women have also changed noticeably rhythmically with the contemporary scientific aptitudes. For long time in the history, science and technology has been considered as masculine subject, thereby promoting a gender gap in the field of science in many societies. But at present women have attained more self-determination to actively take part in the development of science and technologies in spite of lot of problem they face in the work sphere and social structure. As per the report of the United Nations (2011), it has been stated to apply a *Gender Lens to Science, Technology and Innovation*, although it is required a “gender lens” to STI for development to be importantly recognised.

From the time immemorial women have always been effectively understanding the scientific processes and contributing to flourish the field of science. They have made their great efforts for the accomplishment of scientific endeavours. The society has produced the scientific women throughout the centuries, who could develop the very basics in understanding of scientific technology. But unfortunately, they have been continuously hurdled to be accepted in the field of science. The socio-scientific transformation, in due course of time, realizes the importance of gender equality for healthy and developed society.

The statistical data states that women still have seated on poor platform while accessing to information and technologies in comparison to men. The arena of science and technology is still constricted the technological development and technological resources to support women's activities and occupations. In the 21st century world, in most of the countries, the women representation in engineering, physics and computer science is less than 30%. Women face lot of difficulties in perusing the science education and scientific job because of their poor access to finances, property, education and technology. Gender prejudgments, lack of female role models, difficulties in brining into line professional and personal responsibilities are some of the major difficulties. Gender prejudgments present a pitiable belief that women have less talents and inclinations in the field technologies and science. Also, economic status and political power don't support an important role of female in the field of science and technology. In countries where gender equality is considered to be the necessary component of the healthy society, women also have more chances for normal self-expression in different fields.

2. Gender Status in Science and Technology

The overall status says that women account for a minority of the world's scientific researchers. The highly demanding cross nationally comparable statistics on women in science and technology fails to be utilised in policymaking. This fact sheet presents global and regional profiles, pinpointing where women thrive in this sector and where they are under-represented. The global map (Fig-1) depicts the share of women in the total number of researchers by country. Researchers are defined as professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, as well as in the management of these projects (UIS fact sheet 2015).

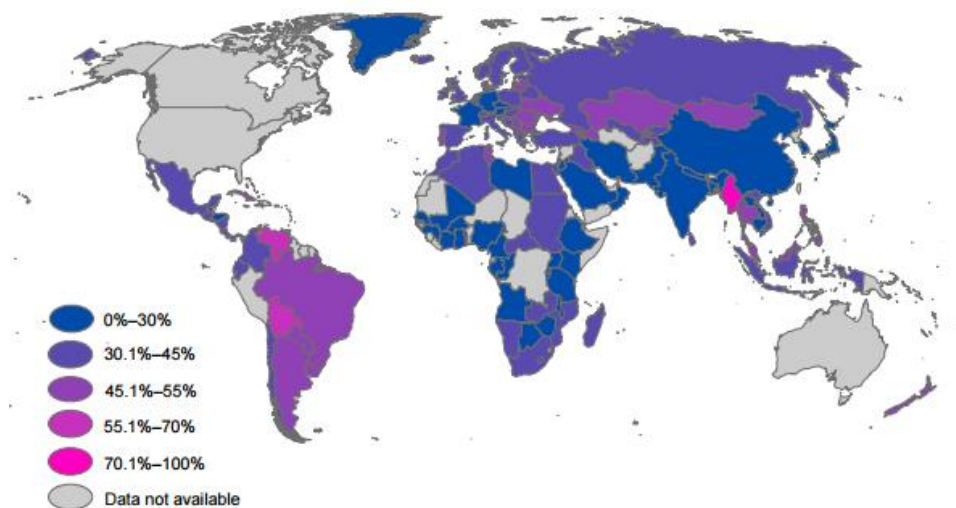


Fig. 1 The Gender Gap in Science. Women as a share of total researchers, 2013 or latest year available Note: Data in this map are based on headcounts (HC), except for Congo, India and Israel which are based on full-time equivalents (FTE)). Data for China are based on total R&D personnel instead of researchers. Data for Brazil and Tunisia are based on estimations. Source: UNESCO Institute for Statistics, October 2015

With an approximate strength of 50 per cent of the global population, women have access to much less than half of the resources in terms of technology, financing, land, training and education, and information. Their participation and involvement in the technological world is still in unequal position. According to UNESCO (2009) figures in 121 countries, women comprise 29 percent of researchers but there were big disparities among regions. For instances, 46 percent of researchers are female in Latin America and the Caribbean. Argentina, Cuba, Brazil, Paraguay and Venezuela have achieved gender parity in science and technology field. The status is worse in Asia where women constitute only 18 percent of researchers. India and Japan have 13 percent female researchers and South Korea has 15 percent. In Africa women comprised about 33 percent of researchers. It is hardly found any country where women's participation makes even 50 percent. Although female participation in biological, medical and life sciences is very high, even above 50 percent in some countries, but, in physics, computer sciences and engineering, the participation rate of women is less than 30 percent in most countries. Such scenario represents that gender inequality persists in the present world and it is necessary to focus on the problems. The Baltic countries show the best results in this sphere. However, women's engagement in science and technology in some countries is comparatively high and is often higher than 50%. In Lithuania it is 68.3 %, in Estonia it is 63.9%, and Bulgaria and Latvia shows 63.8 % and 63.2 % of female engagement respectively.

Women availing modern education in India began in the early years of the nineteenth century and the process was so sluggish till 1921 to achieve the literacy of 0.2% in 1883 to 1.8% in 1921 (Neelam, 2008). Thereafter the female education got its momentum and reached a fair position in 1950. The progress of women's education in the first decade of independence became satisfactory as had been reported by the National Committee on Women's Education in 1959 (Kamat, 1976). During the first five 'five year plan' (1951-79), excepting some welfare measures, no such big steps were taken for the women education. The sixth five year plan (1980-85) witnessed a change from 'welfare' to 'development' for women, when actually women could access the field of science and technology in real sense. According to the Committee on Differentiation of Curricula for Boys and Girls established in 1964, the subjects in which women's enrolment increased significantly during the decade of 1970-1980 are commerce (3% to 16%); Science (18% to 28%) and Education ('36% to 48%). The data given in table-1 indicate the progression of girls' in University education in science.

Table 1: All India Enrolment of Girls as percent of Total Enrolment in University Education by Faculty

| Year | Arts | Science | Commerce | Education | Eng/Tech | Medicine*** |
|---------|------|---------|----------|-----------|----------|-------------|
| 1960-61 | 18.6 | **** | 1.1 | 32.5 | 0.8 | 20.4 |
| 1970-71 | 33.5 | 18.5 | 2.8 | 37.3 | 1.0 | 21.3 |

| | | | | | | |
|------------------|------|------|------|-------|-------|-------|
| 1980-81 | 37.5 | 27.9 | 15.2 | 46.7 | 4.6 | 23.8 |
| 1990-91 | 39.8 | 36.8 | 24.0 | 44.2* | 10.9* | 34.3* |
| 1995-96 | 41.5 | 35.5 | 29.0 | 41.2* | 14.2* | 34.5* |
| 1999-2000 | 44.9 | 37.4 | 34.0 | 42.6* | 16.2* | 37.8* |
| 2001-02 | 43.8 | 39.1 | 38.7 | 43.5 | 24.9 | 40.6 |
| 2003-04** | 45.5 | 39.8 | 36.7 | 52.1 | 23.1 | 46.3 |

Note: *Only for degree level, not post graduate **estimated

*** Excludes dentistry, public health, nursing, midwifery and pharmacy.

**** For the year 1060-61, arts and science data is combined

Source: *Manpower Profile India Yearbook 2000-2001, and 2005, Institute of Applied Manpower Research, New Delhi, India.*

3. Minimising the Gender Gap

The world, though, have attained the striking reversal of the gender gap in education (Buchmann and DiPrete 2006; Legewie and DiPrete 2009), women still pursue science and technology degrees at much lower rates than those of their male peers. The gender gap in science and technology becomes visible when male and female approaches to technological innovations differently, and accordingly they set different approaches in life. Men, by nature, want to expand their influence and women are ready to adapt technologies and make their use easier and more comfortable for people. That may be the reason why men intend more likely to invent new things, while women wish to improve things which already exist. Studies show that women are more interested in jobs involving people and social interactions, and women emphasize intrinsic, altruistic, and social rewards associated with an occupation. Men, in contrast, are more interested in jobs involving physical objects and abstract concepts, and they place a higher value on extrinsic rewards such as money, prestige, and power (Beutel and Marini 1995; Johnson 2002; Konrad et al. 2000). That does not make men superior to women nor vice versa rather their combine effort and knowledge will give the best results.

The developing countries express the problems with gender inequality and lack of professional opportunities for women in the field science and technology. In primary and secondary education level boys and girls have usually equal participation, but the situation changes in higher education. Sociological and social psychological research on the gender gap focuses on explanations based in widely shared gender beliefs and stereotypes that have implications for housework and childrearing, math and science ability, occupational selection, and career trajectories (Charles and Bradley 2002). Some changes in the curriculum would be useful to minimise the gender gap in science and technology education and create necessary conditions for their further employment in this field. Men and women are to be given equal priority in education and employability. Sensitising them with updated information would resolve the mentality behind the gender gap in science. Early and effective education is certainly a strong factor that influences the distribution of social roles and positions. Good healthcare and mother care and awareness will also contribute in creating better career opportunities for women.

The following are few points which can be given attention in order to constrict the gender gap.

- 1) Early science education, particularly in primary school, plays an important role in making interest among children for higher study. Acquisition of skills that occurs in early childhood and primary school serves as the foundation for all future learning.
- 2) During the years of early education, children have the greatest opportunity to develop the cognitive and non-cognitive skills that can lead to greater achievements later in life.
- 3) A commonly bias on the portrayal of men as “active” in the field of science and females as “passive” and occupying subordinate positions is to be removed.
- 4) Organization of annual science fairs and quizzes at the state and national levels for both primary and secondary students specifically targeting females may create interest among them for higher scientific study. It is good practice to adopt a gender equity focus in career days, science fairs, competitions and information campaigns.
- 5) Positive role models of female and male scientists from diverse racial/ethnic groups are to be interacted with the girl students for effective influence on them.
- 6) The stereotypes about science should be dispelled and opportunities for students are to be created to see science as part of their everyday experiences.
- 7) Research and academic institutions should pay attention to the student experience as well as faculty diversity to improve recruitment and retention of women.
- 8) Institutional support for Women in early career research and support systems may be extended in form of technical training courses, facilitation and support, awareness and orientation courses, support for flexible working hours and national/international mobility.
- 9) Women should be provided extended child care leave and allowed to attend conferences and seminars during maternity leave.
- 10) Alternate career options for women in science and technology, assistance in career progression, encouraging women entrepreneurship etc. should be undertaken by the Government.
- 11) International Mobility and Networks Propose better exchange programmes for doctoral and post-doctoral programmes which should also include female specific programmes.
- 12) Awareness needs to be generated among women about the programmes and schemes run by the Government. Orientation programmes and workshops should be organised for women students and scientists.
- 13) Special fellowships for women scientists for attending conferences and short term visits abroad should be facilitated.
- 14) Wherever possible, child day care and elderly care facilities should be provided during conferences and workshops. The Government should mandate that every delegation has women representation.
- 15) There should be relaxation in age for women scientists in existing programmes and projects. Women scientists should be encouraged and promoted to go and teach in foreign universities as understanding diversity is important for progress.

4. Conclusion

The gender gap in science and technology has remained as a long continued problem throughout the world, though at different rates in different regions. In the developing countries mainly the problems with gender inequality and lack of professional opportunities for women in science and

technology is more visible. While women play an important role in the contemporary society and contribute greatly for its development, their under representation in the sphere of science and technology is really unfortunate. Among the various reasons of this inequality, gender bias, prejudices and unequal distribution of resources are dominating ones.

The information concerning the problem transferred to men and women can help to resolve it at various stages and circumstances. Education should become another strong factor which influences the distribution of social roles and positions. In the developing countries, it is necessary to make sure that women have equal with men accessing to primary, secondary and higher education. Some changes in the curriculum would be useful to help girls and women to get more information about the science and technology sphere and create necessary conditions for their further employment in this sphere. As mentioned above, good healthcare and mother care become those factors which help to create better career opportunities for women. The women having major role and important contribution in science and technology sector should be popularised in the society so that it would also help to reduce the gender gap in this sphere.

In India scientific organisations are prone to extremely hierarchies, which include gendered hierarchies enormously. It is very difficult for the women employees confined in junior positions to be promoted to senior decision-making positions in most of the work stations. In such cases women have to drop out of the race or to compromise on their ambitions. In academic hierarchy it is found that the number of females becomes lesser with higher positions (Kumar, 2001). Against all such work cultures, the participation of women is gradually increasing not only in Life Sciences and Chemistry but also in Earth Sciences or Physics and Mathematics. Efforts to promote participation in many countries increased the enrolment of women in the areas of science and technology slightly in the 1980s and 1990s, from around 10–15 per cent to 20–25 percent. Since 2000, however, this progress seems to have declined again, down to 10 percent in some countries, along with declining enrolment of men in many countries. This decline seems to reflect the perceptions of young people relating to traditional curricula and pedagogy in engineering and science. But the current promotional activities all over the world may bring handful of opportunities for women in the field of science and technology, which can lead the optimal rise of their participation in scientific education and employability.

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