

Changing trajectories: More women needed in science, technology, Engineering and mathematics (STEM) in India

Women make up less than 30 per cent of the world's researchers. According to a report by the National Task Force on Women in Science, the numbers of women in science are even lower (15%) in India. The world has benefited enormously from known contributions by women in the field of Science, Technology, Engineering and Mathematics (STEM) — from the pioneering work of Marie Curie in multiple fields related to radioactivity to the contributions of Internet pioneer, Radia Perlman, the “Mother of the Internet”. There are infinite examples where contributions made by women remained unacknowledged and hidden and was often wrongly attributed to their male counterparts.



ISRO scientists, Muthayya Vanitha, and Ritu Karidhal who headed Chandrayaan-2 mission

In India, women have shown that they are strong contributors to science and technology (S&T). Say, the Chandrayaan-2 mission to the moon was led by ISRO scientists Muthayya Vanitha, project director, and Ritu Karidhal, mission director. To quote the headlines, the two “*shattered the glass ceiling and aimed for the moon*”. Like them, other women have led and contributed to important developments in Indian science.

Women's enrolment in higher education institutions has witnessed a remarkable increase in India, number increased from 13 lakhs in 1990 to 27 lakhs in 2000, and then to 142 lakh women in higher education institutions in 2017. Yet women's representation in S&T and the rate of growth is deeply sub-optimal for a country with as many aspirations as India.

Science, technology, research and development are essential for inclusive and sustained economic growth. Not enabling 50 per cent of the population to contribute is a blunder. Studies

show that addressing this issue will increase Gross Domestic Product (GDP) and bring deeper, broader and more representative approaches to science and development. We could not only change our trajectory for scientific and technological development, we would also change society by addressing the targets set under the Sustainable Development Goal (SDG) 5 — ensuring gender equality.

As of April 1, 2015, only 13.9 per cent of all personnel engaged in research and development (R&D) in the country were women. According to the latest R&D statistics at a Glance 2017-18 brought out by the department of science and technology (DST), Government of India, women's participation in extramural R&D projects supported by various Central S&T agencies was 29 per cent in 2014-15.

Women in India are already at a disadvantage due to the lower enrolment rate of girls at the primary school level. Girls are more likely to drop out of education systems early, especially in resource-poor families, due to deeply ingrained gender biases. Alarming, in 2019-20, we ranked 112th of 153 countries in the World Economic Forum's (WEF) Global Gender Gap Index.

Today, we stand at a crucial juncture of promoting women in S&T with several programmes already in place to serve the purpose. In 2014, the Department of Science and Technology (DST), Government of India, restructured all women-specific programmes under one umbrella called Knowledge Involvement in Research Advancement through Nurturing (KIRAN), to bring gender parity in STEM. Under this scheme, women scientists are encouraged to pursue research in frontier areas of science and engineering, on problems of societal relevance and to take up STEM-based internship followed by self-employment. Added to this, DST's women's technology parks (WTPs) act as a single window hub for convergence of diversified technologies, leading to socio-economic development of women through capacity building and adoption of location-specific technologies.

To begin empowering younger students, the department launched Vigyan Jyoti in 2019 to reach out to girls in select districts at primary education institutes, to support an interest in science through mentorships and interactions. Initiatives like these, led by government bodies like DST and other programmes run by the Department of Biotechnology and private organisations can go a long way in addressing the gender disparities in STEM.

India Health Fund, collaboration by Tata Trusts and Global Fund, is addressing the need for creating an enabling environment where women in STEM can transition their research into solutions. The initiative provides technical and financial support to innovators in India in developing key solutions in tuberculosis (TB) and vector-borne disease elimination.

As part of their overarching goal to facilitate more and more research and development in public healthcare systems and technologies, the Fund is committed to empowering women innovators and enabling them to bring their technologies from lab to the market. For instance, IHF supported the exceptional work of Dr Maroudam Verrasamy, founder of CisGen Biotech Discoveries, which developed diagnostic kits that uses a combination of native and recombinant antigens to detect bovine TB. Besides this, IHF also supported Dr. Nerges Mistry and Kalpana Sriraman of the Foundation of Research in Community Health (FMR) in developing bio-medical solutions for addressing infectious diseases, such as TB.

While the steady increase in the numbers of women in science is heartening, the effects of the continued underrepresentation of half the population can have far-reaching adverse effects. In healthcare, for example, we are now learning women's health has taken a backseat, with the lessening of research aimed specifically at understanding the varied differences in female physiology. Studies have shown, for example, that the risk of heart disease in women is often underestimated due to different clinical representations or symptoms and a lower representation in clinical trials.

Education is a critical tool in empowering women. We need to ensure that girls across the country have not only access to basic education but also to financial and societal support for them to pursue an education in STEM and in this way empower more women, like Muthayya Vanitha and Ritu Karidhal, to make an impact in the country's scientific progress.

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