Gender parity in science: the intersection of the National Education Policy 2020 and the draft Science, Technology, and Innovation Policy

WITH INTERNATIONAL WOMEN'S DAY OBSERVED ON 8 MARCH, JYOTI SHARMA'S REVIEW OF THE NATIONAL EDUCATION POLICY 2020 AND THE DRAFT SCIENCE, TECHNOLOGY, AND INNOVATION POLICY THROUGH THE LENS OF GENDER PARITY IS A TIMELY REMINDER OF THE NEED TO SUPPORT IMPROVED PARTICIPATION OF WOMEN IN SCIENCE.

Science and technology are rapidly changing the world. Future jobs will need a skilled workforce with expertise in areas such as engineering, big data, machine learning, and artificial intelligence. An emerging scarcity of resources, water, and food, climate change, and the rise of infectious diseases will require multidisciplinary research and trained manpower, especially in the areas of Science, Technology, Engineering, and Mathematics (STEM).

Quality education and gender equality are two of the UN's most important Sustainable Development Goals (SDGs) . The provision of quality education to both boys and girls is a significant indicator for every nation's growth and its capacity to tackle global challenges. Economic development and sustainability targets may become difficult to achieve without addressing the issues of diversity, gender, equity, inclusion, and equal opportunity for all. Recent studies by the UN and McKinsey show that women's participation in education can enhance creative thinking, innovation, productivity, and add approximately USD 13 trillion to the global Gross Domestic Product by 2025.

According to the *All India Survey on Higher Education (2018-19)*, women have achieved parity at the bachelor's (53 per cent) and master's levels (55 per cent) in India over time. However, the Department of Science & Technology estimates that active women researchers are only about 18.8 per cent in Indian research and development establishments. This data indicates that there is a need for revolutionary gender-inclusive educational reforms that span the life cycle of women from early education to professional courses in science.

In India, the new National Education Policy (NEP) 2020 was released in July 2020 and a Science, Technology, and Innovation Policy (STIP) is on its way. The NEP and draft STIP reflect a self-confident and *Atmanirbhar* (self-reliant) India. The spirit behind both policies seeks to inculcate innovation, creative thinking, and problem-solving attitudes at all levels, especially in young students, and facilitate the development of scientific prowess. The base of both policies is clear and broad: supporting grassroots innovation and promoting scientific literacy at all possible levels.

On the one hand, NEP provides a comprehensive framework for enhancing the quality of education in our country. It focuses on overhauling learning from pre-school to higher education. On the other, the draft STIP targets achieving technological self-reliance, and aspires for India to be among the top three scientific superpowers in the decade to come. The draft STIP is decentralised, evidence-based, experts-driven, and inclusive, and has been developed after 300 consultations with the involvement of over 43 000 national and international stakeholders.

National Education Policy 2020

NEP encourages student-centric pedagogies with a focus on active learning, design thinking, and higher-order analytical skills. It recognises the need for early participation in research at the frontiers of innovation. To achieve that, the quality of institutions has to be strengthened to make them competitive and at par with the global best. In addition, the policy recognises the special and critical role that women play in society and in shaping the economy. NEP recommends that policies, programmes, and schemes designed to include students from Socially and Economically Disadvantaged groups (SEDGs) should especially target girls.

The NEP recommends the constitution of a Gender-Inclusion Fund and its utilisation through states to build the nation's capacity to provide equitable quality education to girls as well as transgender students. The fund will focus on ensuring 100 per cent enrolment of girls in schools, record high participation rates in higher education, decreasing gender gaps at all levels, gender equity and inclusion in society, and improving the leadership capacity of girls through positive civil dialogue. For equal and full participation of girls, *Kasturba Gandhi Balika Vidyalayas* will be strengthened and expanded to increase the participation of girls from SEDGs in quality schools (up to Grade 12).

According to the *Children in India 2018* report, released by the Ministry of Statistics and Programme Implementation, India's dropout rates for girls are as high as 57 per cent by Grade 11. The Times of India reported that a lack of proper menstrual hygiene management facilities, poor infrastructure, and sexual harassment are some of the reasons for girls being frequently absent or dropping out of secondary school altogether. NEP underscores the need for an effective, timely, and widely known mechanism for reporting, with due process for any infractions against students' rights or safety – particularly girl children and the various difficult issues faced by adolescents.

Science, Technology, Innovation Policy 2020

The topic of inclusion of women in science or science for women is not new for the Indian government. The Government of India had adopted the National Policy for Empowerment of Women in 2001 which emphasised the involvement of women in science and technology. Subsequently, the government implemented a scheme, Science and Technology for Women (S&T for Women) through the Department of Science and Technology (DST). Later, the S&T policy 2003 aimed at ensuring full and equal participation of women in science. The Science, Technology, and Innovation (STI) Policy 2013 introduced new and flexible schemes under the broad umbrella KIRAN - Knowledge Involvement in Research Advancement through Nurturing with the primary goal of utilising the full potential of women to empower the nation.

DST is working proactively to bring gender parity to the S&T domain through a multifaceted approach. It runs many women-centric programmes to support women from an early age in building a successful career in STEM. Apart from schemes like *Vigyan Jyoti* for school girls, WOS A, B & C schemes for women with career-break, training in international laboratories through the Indo-US Fellowship for Women in STEMM (WISTEMM), and the establishment of state-of-the-art research facilities in women-centric universities through the Consolidation of University Research for Innovation and Excellence in Women Universities (CURIE) programme are some of its other initiatives. A pilot programme Gender Advancement for Transforming Institutions (GATI) has been launched in 20 Indian institutions. Further, DST is organising theme-based training programmes and establishing laboratories for women scientists to prepare them for future jobs.

In the context of the draft STIP, the thematic group Equity and Inclusion is one of 17 thematic groups that dealt with the issues of under-representation of women and other minority groups in Indian science during the development of the policy (https://dst.gov.in). The draft policy states that equity and inclusion are foundational pillars of the science ecosystem. Dr Yarlagadda and I have highlighted in one of our articles in *Teacher* (volume 14, issue 4) that this policy addresses the existing gaps and challenges that are responsible for pushing back women in the field of S&T. The article describes low institutional support, leadership issues, age-barrier issues, leaky pipeline, societal stereotypes, the importance of role models, need for flexible support, and funding for women-led start-ups.

For developing holistic individuals, an identified set of skills and values must be incorporated at each stage of learning. STIP takes forward the idea of engaging students with real world problems by synergising schools, higher education institutes, corporate entities, and local communities. STIP has made recommendations on the mandatory representation of 30 per cent of women in all apex committees and decision-making groups, addressing issues related to career breaks due to family and social responsibilities, a dual recruitment policy for couples, and the institutionalisation of equity and inclusion by the implementation of the successful Athena SWAN Charter in Indian institutions (see reference list for further reading).

The *Vigyan Jyoti* programme was launched by DST in 2018 for supporting girl students in pursuing higher studies and careers in STEM, eventually leading to a higher representation of women in research. The pilot project was extended further in 2019 with the participation of about 2 900 students. Recently, it commenced a second phase, with a partnership with IBM India on the International Day of Women and Girls in Science on 11 February 2021 to cover 50 more districts, in addition to the existing 58 districts across the country. *Vigyan Jyoti* activities involve student-parent counselling, interaction with role models, visits to national research laboratories, science camps, scholarships, and career counselling.

Apart from Vigyan Jyoti, MANAK (Million Minds Augmenting National Aspirations and Knowledge) for schools, National Children Science Congress (NCSC), Initiative for Research & Innovation in STEM (IRIS), and the Atal Tinkering Laboratories are other pathways for creating a research environment in schools and encouraging school students to find a solution for real world challenges. These specific programmes are aimed at fostering a culture of innovation among school children and attracting talented young students to study science and pursue research as a career. The DST website reports that programmes like MANAK and *Vigyan Jyoti* may help girl students to improve their confidence in STEM subjects as so far out of a total of 1.386 Million MANAK awards sanctioned till 2018, about 47 per cent of the awardees were girls.

Conclusion

Both policies are parallel by design, complementary, and offer cross-cutting priorities to achieve gender equality and inclusion. The Gender Inclusion Fund proposed in the NEP aims to ensure 100 per cent enrolment of girls in schools and reduction of the dropout rate at every level. The STIP recommendations and ongoing programmes are expected to facilitate the conversion of these enrolments into sustainable skilled manpower and future leaders. The safe and secure environment promised by NEP will be nurtured by a vibrant science, technology, and innovation ecosystem following the recommendations of STIP.

NEP emphasises the need for increasing the number of women in leadership positions including principals, teachers, wardens, and other staff; similarly, STIP supports a programme for engaging students, and training teachers, principals, and leaders of schools to develop a scientific temper and foster a culture of continuous learning with creative thinking. The short-term courses, workshops, mentoring, and online science content communication will help to integrate science and technology in the education ecosystem and introduce women STEM experts as role models for girl students. NEP promises to revise the school curriculum and make it gender-neutral, technology-oriented, and more relevant for sustainable employment. These steps may support the goals of STIP to achieve 30 per cent participation of women in STEM careers and help them reach leadership positions.

The success of the popular global model roll-out by the DST in Indian institutions will rest on the collective efforts and coordination of implementing agencies, administration of a particular institution

and more critically the Ministry of Education. However, the proposed vocational courses under NEP may not be fully successful without the active participation of the Ministry of Science and Technology and the involvement of start-ups incubated by DST which generated 65 864 jobs as cumulative direct employment and created a wealth of INR 272 620 million from 2014-19 (see *The Times of India* report to learn more about start-ups incubated by DST). We look forward to the two policies working in harmony to bring about far reaching changes to our education system. T

AUTHOR

Jyoti Sharma is a Senior Scientist in the International Cooperation Division (ICD), Department of Science and Technology, Ministry of Science and Technology, Government of India.

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