Exploring Gender Equality in STEM

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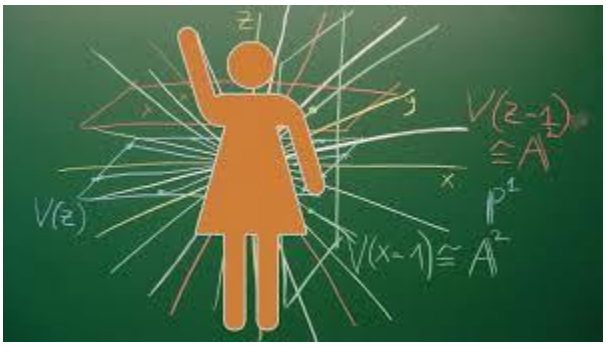


Future approaches for gender equality in science across geographies should focus on systemic, actionable change. Key strategies include enacting institutional policy shifts, flexible work, transparent hiring, bridging the digital divide, promoting mentorship and sponsorship, and implementing data-driven monitoring of STEM equity, as emphasized by UNESCO and the International Science Council. S. K. Varshney writes.

The importance of gender equity in leadership and international STEM cooperation is acknowledged at various forums. Women, especially those from the global south, remain under-represented on several global platforms that shape our world's future. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has acknowledged that the under-representation of women in STEM results in a loss of talent, innovation, and their full participation in the growth that ultimately reduces the development of each country.

Women researchers are leading several cutting-edge research projects and are part of remarkable discoveries. However, their representation is curtailed at higher or leadership positions. Despite 50 percent enrolment at the graduation level, only 30 percent of the world's researchers are women. Women share 3 percent in Nobel Prizes for science, 3 percent of the Shanti Swaroop award, a poor percentage of academic awards, and only 11-15 percent are working at leadership positions throughout the world. These figures underline the need for gender parity in various international collaborative formats.

According to the most recent estimates for the Organisation for Economic Co-operation and Development (OECD) countries such as Belgium, Italy, Finland, Sweden, Spain, Norway, United Kingdom, Russia, and Poland, women representation is more balanced. Several other countries like Turkey and Singapore are also balanced as women are representing between 30-45 percent of the total researchers, though Japan and South Korea have a significant gender imbalance among researchers with a women's percentage of 15 percent and 19 percent respectively.

Most of the countries like Australia, Brazil, India, Japan, Korea, the UK, and the USA understand that gender parity could be achieved with set targets in prescribed timeline with international cooperation and sharing of the best practices. Following this, representation of women in scientific positions has increased but women are clustered in certain disciplines and

are still excluded from core disciplines of natural sciences and leadership positions. Even though women comprised approximately 50 percent of the share in the medical field, there is only one woman director in the history of one of the prominent medical institutes of India i.e., the All India Institute of Medical Sciences (AIIMS). Leadership in prestigious engineering institutes, like Indian Institute of Technology (IIT) is yet to be achieved by women.

Most of the international reports revealed that women researchers are facing similar barriers across the world, despite their cultural and geographical contexts. The lower representation of women from most of the countries indicates an urgent need for international collaboration in this area. The common targets of SDGs persuade the use of science diplomacy to achieve gender parity in STEM. Lessons may be learned from the Muslim dominating countries like Jordan, Malaysia, and Tunisia where 50 percent of women are working in engineering and technical professions.

Addressing on Women's Day, Indian Science Minister Dr Jitendra Singh said that “women in science are not merely participants but powerful catalysts" in India’s journey towards *Viksit Bharat*. The Minister underlined that scientific growth and national development are inseparable, and that inclusive participation especially of women is essential to sustaining India’s innovation momentum. He stressed that sustained institutional support, early-stage mentoring, and translational pathways are critical to ensuring that research outcomes convert into tangible societal impact. He said that empowering young students, particularly girls, through structured exposure to laboratories and research institutions will create a multiplier effect in the years ahead.

Future approaches for gender equality in science across geographies should focus on systemic, actionable change rather than just increasing participation. Key strategies include enacting institutional policy shifts, including flexible work, transparent hiring, bridging the digital divide, promoting mentorship and sponsorship, and implementing data-driven monitoring of STEM equity, as emphasized by UNESCO and the International Science Council. It should include systematic structural changes, data driven monitoring, targeted mentorship and sponsorship, visibility and role models, intersectional approaches and focus on participation of women in the emerging technology sector. We need to bridge the policy gap for gender equality, regional focuses, and empowerment for women leadership.

SCIENCE POLICY & DIPLOMACY

International S&T Cooperation

India Science Day 2026 at TU Wien

Hosted by TU Wien on 20 March 2026, the event marked a new phase in India–Austria scientific cooperation by bringing together researchers, policymakers, and industry stakeholders. It focused on strengthening joint research, innovation partnerships, and cross-border technology collaboration, while facilitating dialogue on future S&T initiatives.

UK-Ukraine Strategic Dialogue Held

UK Prime Minister Keir Starmer and Ukrainian President Volodymyr Zelenskyy held the UK–Ukraine Strategic Dialogue to strengthen bilateral cooperation. The dialogue provides a comprehensive framework across multiple sectors including science, technology, innovation, energy, and climate, aimed at advancing joint priorities and deepening long-term partnership.

EU and Ghana to Strengthen Partnership

The EU and Ghana signed a formal bilateral partnership framework covering cybersecurity, hybrid threats, climate-security nexus, and emerging technology-linked risks. It also includes transfer of electronic warfare systems and a structured annual dialogue mechanism for cooperation.

Japan–France Hold 11th Joint Committee on Science & Technology Cooperation

They discussed future cooperation in strategic fields of mutual interest such as quantum technologies, artificial intelligence, health, and agriculture; directions in the fields of space, nuclear energy and fusion. Both sides aim to promote research mobility and sign/renew institutional cooperation agreements

European Commission and UN Environment Programme Reaffirm Commitment to Science and Global Environmental Cooperation

The European Commission and UNEP reaffirmed their commitment to global environmental multilateralism and science-based policymaking at a high-level meeting in Brussels. They emphasized stronger cooperation on climate change, biodiversity, pollution, and water management. They also stressed the need to reinforce science in environmental decisions and advance global environmental governance amid geopolitical challenges.

Emerging Tech & Governance

India Approves Quantum Teaching Laboratories in 23 Institutions Under National Quantum Mission

The Ministry of Science & Technology has approved the establishment of quantum teaching laboratories in 23 academic institutions across India, with 100 more under consideration under the National Quantum Mission. The initiative aims to strengthen advanced research, training, and capacity building in emerging quantum technologies.

White House Unveils National AI Policy Framework

The White House released the National Policy Framework for Artificial Intelligence: Legislative Recommendations on 20 March 2026, outlining a roadmap for federal AI regulation. The framework calls for a unified national approach, emphasizing innovation, child safety, intellectual property protection, and workforce development. It aims to guide Congress in creating legislation while limiting fragmented state-level AI regulations.

UNESCO AI Day 2026 Highlights Role of Youth in Driving Digital Transformation

UNESCO AI Day 2026 was held on 26–27 March 2026 at its headquarters in Paris, focusing on "Youth and Digital Transformation." The event brought together policymakers, researchers, and young innovators to explore how artificial intelligence can support sustainable development and strengthen South–South cooperation.

IISC Develops Method to Steer Quantum Sensors Inside Living Cells

Researchers at IISc have developed a method to guide quantum sensors inside living cells using magnetic microbots. This allows highly precise measurement of temperature and viscosity in complex biological environments. The breakthrough could enable advanced, minimally invasive tools for cellular diagnostics and biomedical research.

Events & Meetings

International Workshop on 6G Standardisation Held in New Delhi

Bringing together global experts from government, industry, academia, and international standardisation bodies to discuss the evolving roadmap for sixth-generation (6G) telecommunications, the workshop aimed to position India as a global leader in designing and deploying 6G technologies by 2030. It focused on key themes including AI-enabled networks, spectrum planning, security frameworks, and next-generation network architecture, along with India's role in global telecom standard-setting.

National Exhibition under Mission सह-SANKALP Showcases Science-to-Society Innovations

The Office of the Principal Scientific Adviser organized a national exhibition-cum-technical event under Mission सह-SANKALP in New Delhi, bringing together ministries, research institutions, and stakeholders. The event showcased over 100 technologies and promoted convergence-driven innovation for livelihood transformation. It aims to strengthen science-to-society linkages and improve coordination for scaling demand-driven, socially relevant technologies across India.

CSIR and MEA Host Ambassadors from the Global South for Capabilities Discovery Session

The event showcased India's science and technology strengths across health, climate, infrastructure, and sustainable development sectors. It aimed to deepen South–South cooperation through science diplomacy, joint research, and technology sharing.

INDIAN SCIENCE NEWS

NIPER Raebareli and Roche Pharma India Sign MoU to Strengthen Pharmaceutical Education and Research

The partnership will support training programmes in regulatory affairs, guest lectures, and industry-linked learning initiatives. It also aims to strengthen India's capacity in AI-driven drug development, biologics, and healthcare innovation under academia–industry collaboration.

Scientists Convert Spent Battery Graphite into High-Value Fuel Cell Catalyst

Scientists from International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) have developed a method to recycle graphite from used lithium-ion batteries into a functional material for fuel cell catalysts. The exfoliated graphite improves oxygen reduction reaction efficiency, methanol tolerance, and durability when combined with platinum. The innovation supports sustainable battery waste reuse and advances cleaner energy technologies.

Next-Generation Coordination Polymers Enable High-Performance Energy Storage and Green Hydrogen Production

Scientists from Centre for Nano and Soft Matter Sciences (CeNS) and CHRIST University have developed zinc- and cadmium-based coordination polymers that show exceptional performance in energy storage and hydrogen generation. The materials demonstrate high capacitance, strong cycling stability, and low energy requirements for water splitting. This breakthrough offers a promising route toward scalable clean energy and green hydrogen technologies.

Scientists Decode Formation Mechanism of Mesoporous Tin Oxide to Boost Sensors and Batteries

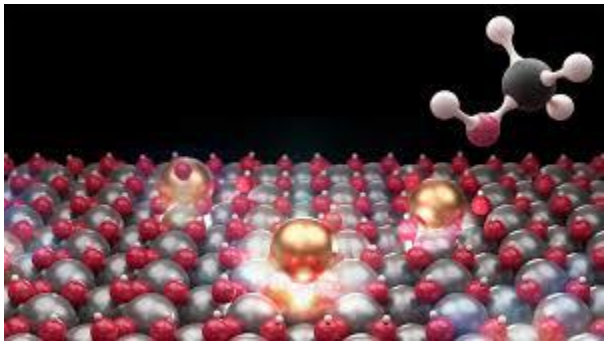
Researchers at ARCI (DST) have resolved the long-standing mystery behind the formation of mesoporous tin oxide (SnO_2) beads used in gas sensors and energy devices. The study shows that crystallization occurs only during high-temperature calcination, enabling better control over pore structure and particle properties. This insight can help improve performance in gas sensors, lithium-ion batteries, and solar cell applications.

CSIR Establishes Pilot Plant for Manufacturing Rare Earth Permanent Magnets in Hyderabad

CSIR–ARCI has set up a pilot plant in Hyderabad for manufacturing Nd-Fe-B rare earth permanent magnets, a critical material for high-performance electronic and energy applications. The facility aims to strengthen India's self-reliance in advanced magnet production. It will support key sectors such as electric vehicles, renewable energy, and defence technologies.

ADVANCES IN S&T

Scientists Convert CO_2 into Fuel Using Breakthrough Single-Atom Catalyst Technology

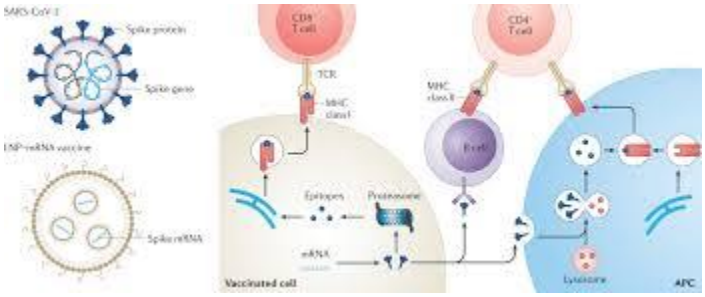


The Problem: Rising carbon dioxide emissions are a major driver of climate change, and there is a strong need for technologies that can efficiently convert CO_2 into useful fuels. However, existing catalytic systems are often inefficient, require high energy input, and lack precise control over reaction pathways, which limits their large-scale application in carbon utilization.

The Method: ETH Zurich researchers developed a breakthrough single-atom catalyst using isolated indium atoms, where each atom serves as an individual active site for the reaction. This atomic-level design improves efficiency and selectivity in converting CO_2 into methanol by minimizing energy loss and enhancing control over chemical reactions compared to conventional metal cluster-based catalysts.

Future Prospects: This innovation could enable scalable and energy-efficient production of carbon-neutral fuels such as methanol, contributing to both clean energy generation and reduction of atmospheric CO_2 levels. It also advances the field of single-atom catalysis and may support future developments in green chemical manufacturing and integration with renewable energy systems.

Lipid Nanoparticles Reprogram Immune Cell Metabolism to Enhance mRNA Vaccine Performance



The Problem: mRNA vaccines and lipid nanoparticle (LNP) delivery systems are highly effective but often trigger strong immune side effects such as inflammation, fever, and fatigue. At the same time, LNPs are mainly treated as passive delivery vehicles, even though their interaction with immune cells is not fully optimized. A key challenge is improving vaccine efficiency while reducing inflammatory side effects and improving targeted delivery to immune organs like lymph nodes.

The Method: Researchers engineered lipid nanoparticles by modifying the structure of the ionizable lipid component, a key part of LNPs used in mRNA vaccines. This chemical redesign altered how immune cells metabolize energy, specifically boosting glycolysis in dendritic cells, which enhanced their ability to mount immune responses. At the same time, the redesigned LNPs reduced excessive inflammatory signaling and improved delivery efficiency by directing more mRNA payload to lymph nodes instead of the liver.

Future Prospects: This approach could enable a new generation of safer and more effective mRNA vaccines that produce stronger immune protection with fewer side effects. Beyond vaccines, the ability to reprogram immune cell metabolism through lipid design may open new pathways for treating cancer, autoimmune diseases, and other immune disorders, marking a shift from simple drug delivery systems to intelligent, function-modifying nanomedicine platforms.

INSIGHTS & RESOURCES

UNESCO Global Education Monitoring (GEM) Report 2026

The UNESCO Global Education Monitoring (GEM) Report 2026 was released in March 2026 as part of tracking progress toward SDG 4 (Quality Education). It focuses on persistent gaps in access, equity, and inclusion in education systems worldwide. Key findings include:

- Around 273 million children and youth remain out of school globally, indicating a major access gap.
- Progress in reducing out-of-school populations has slowed significantly since 2015.
- Deep inequalities persist, driven by poverty, gender, disability, conflict, and rural–urban divides.
- Many countries are not on track to achieve SDG 4 by 2030 without urgent reforms.
- Sub-Saharan Africa and South Asia account for the largest share of out-of-school children.
- Girls remain disproportionately affected in several regions due to social and cultural barriers.
- Education financing gaps remain wide, especially in low- and middle-income countries.
- Even among enrolled students, learning outcomes remain poor, with many lacking basic literacy and numeracy skills.
- Conflict and displacement continue to disrupt education access for millions of children.
- The report emphasizes targeted policies, inclusive planning, and better data systems to improve access and equity.

United Nations World Water Development Report 2026 – *Water for All People: Equal Rights and Opportunities*

The UNESCO–UN Water Development Report 2026 was launched on 19 March 2026 at the UN Headquarters in New York, ahead of World Water Day. It focuses on the link between water access and gender equality, providing evidence-based analysis and policy solutions.

The findings of the report include:

- Gender inequalities in water access remain widespread, limiting social, economic, and educational opportunities.
- Women and girls disproportionately bear the burden of water collection, affecting their health, safety, and time for education or work.
- Lack of safe water, sanitation, and hygiene (WASH) services continues to impact vulnerable populations the most.
- Gender-disaggregated data on water is insufficient, hindering effective policy design and monitoring.
- Inclusive water governance, with greater participation of women, leads to more sustainable and equitable water management.

- Persistent financing gaps and weak institutional capacity constrain progress toward universal water access.
- Climate change and environmental pressures are exacerbating existing water inequalities.
- Achieving SDG 6 (clean water and sanitation) is closely linked with progress on SDG 5 (gender equality).