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FMTS WFSW

Science Literacy: A Necessary Pillar for an Equitable Future

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World Federation of Scientific Workers (FMTS-WFSW)

WORLD CONFERENCE ON SCIENCE LITERACY

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01

The Shift to Active Democratic Governance

Public Ignorance *vs*. Democratic Participation

Governance Shift

Autocratic Era: Decisions occurred without public consultation; population well-being depended on leader benevolence or despotism.

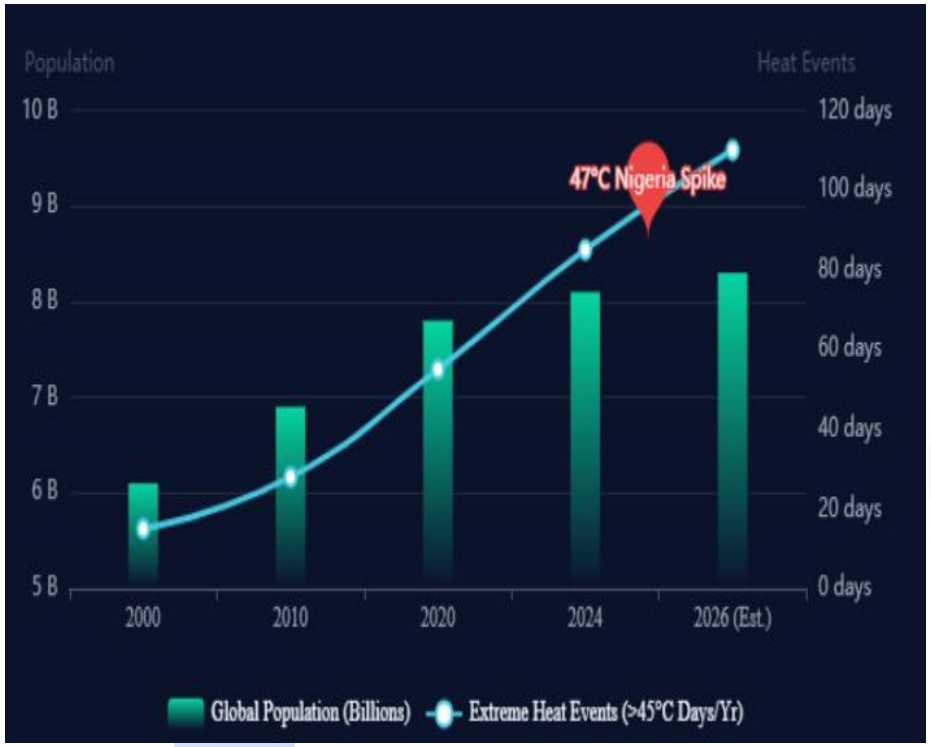
Modern Imperative: Active societal participation is essential for just, equitable governance.

Economic Transition

Structural Evolution: Primary (agriculture) → Secondary (industry) → Tertiary/ Quaternary (knowledge economy).

Urban Advantage: Population concentration in urban centers provides infrastructure for modernized science education.

Climate Emergency & Demographic Strain



10-Billion Target

World population approaching 10B; sustainability is no longer optional—it is mandatory for survival.

Escalating Extremes

Temperatures approaching 50 °C render whole regions virtually uninhabitable (e.g., Sub-Saharan Africa).

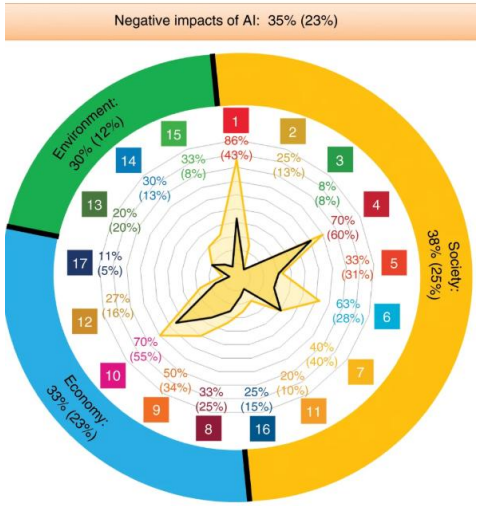
Uninhabitable Zones

Exponential rise in heatwaves, pandemics, ocean level rise, and catastrophic weather events.

Nigeria Case Study

243M populace where historical temperatures rarely hit 40 °C spiked to an alarming 47 °C in 2024.

SDG Twin Pillars Under Threat



Vinuesa *et al. Nat.Commun.* **11**(2020)233.

01

Twin Pillars

SDG 4 (*Quality Education*) and SDG 10 (*Reduced Inequalities*) drive human progress.

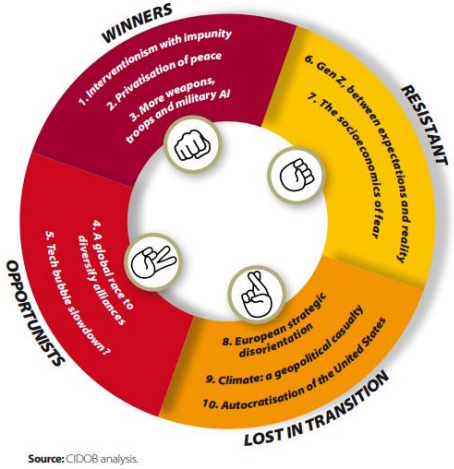
02

Digital Risks

Unmonitored influence of artificial intelligence (*AI*) in basic education risks deepening digital divides.



03



Socio-Political Shifts

Rising political conservatism globally threatens to erode hard-won equity and scientific consensus.

04

Countermeasure

Universal scientific literacy shields public policy from anti-scientific regression.



...NOW

02

Climate Crisis & Dual-Use Tech

The Double-Edged Sword of Science

01

Biomedicine

Genetic engineering offers cures but poses unpredictable ecological and biological risks.



02

Artificial Intelligence

Deep learning drives efficiency but enables autonomous weapons that decouple lethal decisions from human ethics.



03

Democratic Shield

Only an informed public can press decision-makers to strictly regulate high-risk technologies.



04

Mitigation Strategy

Broad literacy ensures technological power is wielded for societal good rather than harm.



03

Institutional Action: Global Best Practices & Case Studies

Initiative case (ICMAB-CSIC, Spain): Matheroes

Gamifying Advanced Science Outreach

Creative science communication platform developed by ICMAB-CSIC.

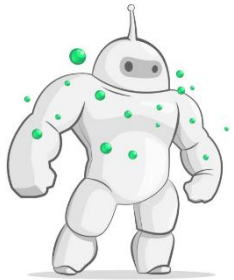
Methodology*: Superhero characters represent frontier materials (superconductors, smart materials) to engage youth and non-experts.*

Impact*: Demystifies abstract nanotechnology and quantum concepts into relatable narratives.*



01 Nanocapsule

Sensor and drug delivery



02 Electro-woman

Molecular electronics



Initiative case “Big Hands Guide Small Hands”

“Big Hands Guide Small Hands” is a scientific outreach and mentorship initiative by Dr. Xiqiu Han that introduces a collaborative educational framework for sustainable development. The program aligns with UNESCO goals and connects established professionals with younger generations to address critical challenges such as climate change and water security.

A new edition will be in Beijing next Tuesday (September 22nd), and we are planning another in Mexico (February 2027).



BIG HANDS GUIDE SMALL HANDS

Women Scientists Spark Children's Science Dreams

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Second Institute of Oceanography, Ministry of Natural Resources, China
Ocean College, Zhejiang University, China
Ocean College, Shanghai Jiao Tong University, China

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Ocean College, Zhejiang University, China

The initiation of the "Big Hands Guide Small Hands" program

In today's rapidly evolving world, the importance of cultivating scientific literacy in students cannot be overstated. Scientific literacy—the ability to comprehend, apply, and engage with science—is not just a skill that prepares individuals for jobs in the future; it is a fundamental understanding that shapes our perspectives, decision-making, and interactions with the world. It is therefore important for personal growth and development as well as for societal advancement.

The concept of "Big Hands Guide Small Hands" was initiated in 1998 by Professor Shouguan Wang, a distinguished astronomer and academician from the China Academy of Sciences (CAS). He proposed the idea of pairing scientists with students, providing them with opportunities to participate in hands-on scientific experiments and research projects, with the aim of guiding them "walk into" the science. His idea was supported by many scientists, China Association for Science and Technology (CAST) and CAS, and eventually led to the establishment of the Beijing Junior Science and Technology Club in 1999. The success and influence of the Club has inspired the creation of similar centers across the country, contributing to the overall development of science education in China.

New Development of the "Big Hands Guide Small Hands" program

STEM (Science, Technology, Engineering, and Mathematics) fields are often perceived as male-dominated. In recent years, China has made significant strides in promoting and empowering women scientists through supportive policies. Various types of "Women Scientists Forum" have been initiated to provide platforms for women scientists to exchange and collaborate with, and inspire young scientists, especially women, to pursue academic careers with enthusiasm and confidence.





Since 2020, with the sponsorship of CAST and the Women Association of Science and Technology, we have been actively involved in organizing Women Marine Scientist Forums. Beyond just scientific exchanges, we implemented the "Big Hands Guide Small Hands" program as a vibrant extension of our forums. Our approach differed from the previous similar programs in that we paired women scientists with primary school students, mainly in Grades 4 to 6, to go on field trips tailored around a specific scientific theme, fostering a unique bond and shared learning experience.

For instance, in 2020, we organized a Women Scientist Forum entitled "From Land to Ocean—She Power in Environmental Protection and Ecological Restoration". As part of this forum, we invited 30 local primary school students to join us on a field trip to Zhairuoshan Island. There, we guided the students through hands-on activities, explaining the geology and biodiversity of the island, and emphasizing the importance of sustainable development. The students were able to observe the nature and ask questions. Last year, in Shaoxing, China, we organized an International Women Scientist Forum focusing on "She Power in Ocean Exploration and Protection". Again, we incorporated the "Big Hands Guide Small Hands" program to provide an interactive learning experience for students. We collected water samples from the Cao'e River and analyzed the water quality. Instead of passively receiving information, students actively explored, experimented, and asked questions. Additionally, students acted as tour guides, introducing local plants and birds to their guests, which was another valuable training opportunity. These activities were warmly welcomed by all. The students were thrilled to participate in the field trip accompanied by women scientists, whom they often only encounter in books or on TV. The women scientists, too, enjoyed spending time with the lovely and eager students, and sharing knowledge with them. Teachers unanimously stated that the program had been immensely beneficial to the students. It stimulated their curiosity and passion for learning, motivated them to explore new interests, and consider STEM-related career paths in the future. Similarly, parents confirmed that the program had been highly advantageous for their children, not only academically but also in fostering family harmony.

Conclusion and Outlook

The "Big Hands Guide Small Hands" program has proven to be a significant bridge between scientists and students. Children are the future of our society. Cultivating curiosity and scientific thinking from an early age lays the foundation for a positive perspective on life and the world, thereby preparing them for the challenges of adolescence and beyond. While male scientists are equally important in stimulating children's interest in science, female scientists possess an innate ability to bring a unique warmth, patience, and nurturing approach that makes science seem more accessible and engaging for children. This approach is particularly important in breaking down gender barriers and stereotypes, and encouraging young girls to consider science as a viable career path.

Looking ahead, we hope to promote and replicate the program both nationally and internationally, with a focus on having more women scientists and primary school children involved. Together, we can cultivate a society where science is accessible, exciting, and inclusive for all.



Global Benchmarks for Science Outreach



SOUTH AFRICA BENCHMARK

Sci-Bono Mobile Labs

Traveling science laboratories delivering hands-on STEM experiments directly to under-resourced township schools.



INDIA BENCHMARK

Science Express

Customized 16-coach mobile climate change train museum reaching 20+ million citizens at rural railway stations.



01

Canal Once – IPN Mexico

Public educational television democratizing science across Latin America through mass broadcasting - 10 M

02

Science Express - India

13,5 M

03

Sci-Bono Mobile Labs – South Africa

20 M

04

The WFSW Roadmap

The Role of FMTS-WFSW

Global Unity

Federation of scientific worker unions and associations advocating for peace and welfare since 1946.



International Networks

Building coordinated South-North scientific networks to bridge educational and research gaps.

Ethical Research

Protecting academic freedom and ensuring research addresses humanity's urgent needs.



Universal Priorities

Science and Technology for the well-being of all. A peaceful and sustainable future is possible.

UNESCO partner

Participation in Recommendations [on Science and Scientific researchers (1974, 2017), on Open Science (2021), on the Ethics of AI (2021)] and in the UN High Seas Treaty (2026).

Website: fmts-wfsw.org

See our activity…

Implementation Roadmap



Curriculum Integration

Embed civic science literacy into basic national education frameworks.

Institutional Support

Mandate public communication funding for state-funded research projects.

Open Science

Expand global open-access repositories for scientific findings.



Digital Safety

Establish international regulatory guards for AI in youth education.

Educational and Research Systems Involved

Assume the need of Science Literacy as a major contributor to critical spirits, founded opinions and democracy.

Inclusivity

Expand grassroots intergenerational programs in rural and underserved zones.

“Science literacy is not an elite luxury—it is an indispensable pillar for democratic governance, equitable progress, and climate survival.”

THANK YOU FOR YOUR ATTENTION

From the abstract: *“Only an informed public, fully aware of both the potential and the perils of technological advancement, can press decision-makers to strictly regulate and mitigate the risks of newly acquired knowledge. Today, as emphasized by the WFSW, addressing humanity's most urgent challenges requires internationally coordinated networks—and expanding universal scientific literacy must be at the forefront of this global effort.”*

FMTS WFSW
Fédération Mondiale des Travailleurs scientifiques
World Federation of Scientific Workers

中国科学技术协会
CHINA ASSOCIATION FOR SCIENCE AND TECHNOLOGY

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EXCELENCIA SEVERO OCHOA
CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS