The Nuclear Energy Agency

Mentoring a Future Generation of Female Leaders in Science and Engineering

Report on the International Mentoring Workshop in Science and Engineering in Chiba, Japan

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Foreword

Despite progress over the past decades, women remain under-represented in executive positions in science, technology, engineering and mathematics. Female students tend to do very well in math and science early in their academic careers but often take other career paths. Many countries are working to close the gender gap and are developing policies to reverse this trend. However, considering the increasing demand worldwide for skilled workers in all areas of science and technology, including in the nuclear energy sector, more advocacy is needed to encourage the next generation and to capture their interest in these fields.

Efforts to motivate young women to pursue careers in science, technology, engineering and mathematics (STEM fields), and to develop policies that support their progression, are worthwhile. Today, many NEA member countries are challenged in stimulating their youth to study in STEM fields. The looming shortfall has serious implications for the future. As part of its overall strategy and mission, the NEA has stated its support to members in their efforts to secure qualified human resources, nuclear skills capability building and the development of a new generation of nuclear experts. It is essential to ensure that all young people, including young women, have the opportunity to explore careers in science and technology. The NEA encourages its membership to explore ways of attracting, recruiting and retaining youth, in particular girls, in science and technology, as well as enhancing the conditions and prospects for women and girls at every stage of their careers and education.

It is in this spirit that the NEA partnered with Japan's National Institutes for Quantum and Radiological Science and Technology (QST) to organise a mentoring workshop on July 25-26, 2017 in Chiba, Japan. This International Mentoring Workshop in Science and Engineering was a positive step, offering young Japanese women what was, for some, a life-changing experience. Seven women leaders from Canada, France, Japan, Russia and the United States led a series of discussions and exercises with young female students, encouraging them to explore science and engineering careers and suggesting ways to overcome potential barriers.

The long-term outcomes of this first international mentoring workshop are yet to be known, but some young students were encouraged and inspired to become science and engineering professionals, which makes this event a success worth repeating.

William D. Magwood, IV
Director General, NEA

“We hope that this workshop showed students that successful role models do exist for women to be science and engineering professionals while maintaining satisfying family lives. If they all go forward to accomplish their dreams, Japan will be a stronger country for it, and the world will be a better place. We have a great deal of hope for them.”

– Closing remarks at “Joshikai for Future Scientists: International Mentoring Workshop in Science and Engineering”

What is the state of women in science and engineering?

Many countries have made efforts to address the lack of female representation in leadership positions in technical fields. Despite these efforts, progress has been slow. This is particularly true in the field of nuclear science and technology, which encompasses not only energy but many other areas such as medicine, manufacturing and the environment.

Career choices made at an early age

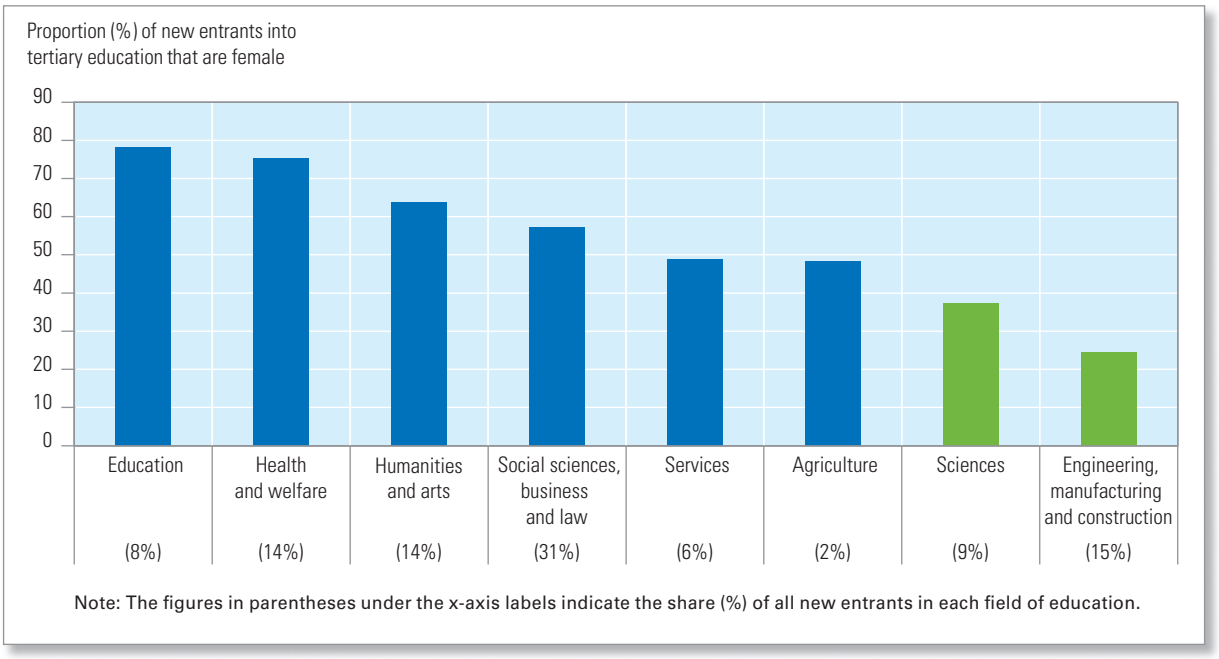
Important divergences on career paths emerge between girls and boys at an early age. Data from the OECD's Programme for International Student Assessment (PISA) show that by age 15, on average, boys are more than twice as likely as girls to expect to work as scientists, engineers or architects. The difference is even greater in relation to professions in the information and communications field, with 5% of boys wishing to pursue a career in ICT while only 0.4% of girls wish to do so. Assessment results have also demonstrated that parents often have different career expectations for their sons and daughters.

At university

Data shows that female students in many countries do very well in math and science early in their academic careers, but they often decide not to pursue careers in these areas, and even though many countries have made progress in reducing or closing the gender gap in terms of educational attainment, women are still under-represented in science, technology, engineering and mathematics (STEM) fields. In 2014, only 37% of new entrants into tertiary-level science programmes were women. This percentage is even lower for engineering, manufacturing and construction programmes (24%), and less than 20% (OECD average) of women enter computer science programmes.

Women are under-represented among new entrants in STEM fields in higher education

Proportion (%) of new students entering tertiary education who are female, by field of education (OECD average, 2014)



Note: The figures in parentheses under the x-axis labels indicate the share (%) of all new entrants in each field of education.

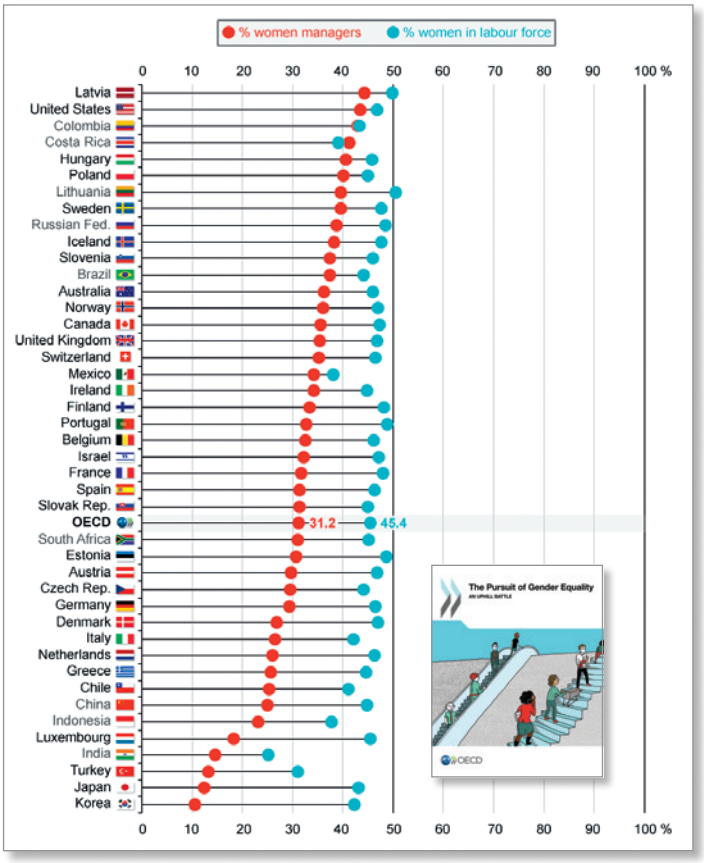
Source: OECD (2017), *The Pursuit of Gender Equality: An Uphill Battle.*

In the workforce

In OECD countries, men are almost four times more likely than women to be employed in engineering and computing. Women remain under-represented in leadership positions with far less chance of becoming CEOs, sitting on boards of private companies or holding public leadership positions. Factors that can explain the "leaky pipeline" phenomenon and the lack of women at the top are the stronger likelihood that they will interupt their careers to care for family, that they work part-time, or that they face discrimination. More work still needs to be done to reverse this trend.

Women are under-represented in management positions

Female share of management employment and female share of labour force, all ages, 2015 or latest available year



Source: OECD (2017), *The Pursuit of Gender Equality: An Uphill Battle.*

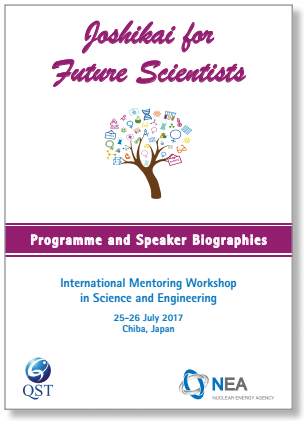
Note: OECD partner countries and accession candidates are indicated in grey.

Cultural and corporate practices are perceived as the main barriers to women's rise to leadership, contributing to a "leaky pipeline" phenomenon

Source: OECD (2012), *Closing the Gender Gap: Act Now.*

“Joshikai for Future Scientists”: The NEA Initiative to Mentor Young Women in Japan

25-26 July 2017 in Chiba, Japan



The “Joshikai for Future Scientists: International Mentoring Workshop in Science and Engineering” was held in conjunction with Japan’s National Institutes for Quantum and Radiological Science and Technology’s (QST) 1st International Symposium on Quantum Life Science.

The two-day workshop opened with remarks during a joint opening session for the QST symposium and the mentoring workshop by Toshiei Mizuochi, State Minister of Education, Culture, Sports, Science and Technology (MEXT); Toshio Hirano, QST President and Aiko Shimajiri, Special Advisor to the Minister, Cabinet Office, Government of Japan. A keynote lecture on quantum biology was given by Professor Johnjoe McFadden of the University of Surrey, United Kingdom. The joint opening session also featured a special video address to the students by Hélène Langevin-Joliot, distinguished nuclear physicist and granddaughter of Marie Skłodowska-Curie.

The co-chairs of the mentoring workshop, Claudie Haigneré, Senior Advisor to the Director-General, European Space Agency (ESA), and Shizuko Kakinuma, Director of the Department of Radiation Effects Research (NIRS, QST) and Unit Leader of the QST Diversity Management Unit, delivered closing remarks during a joint session with the QST symposium and reported on the outcomes of the workshop discussions.

Over the two-day event, 55 female students from high schools around Japan, accompanied by 16 teachers, had the unique experience of exchanging with 7 highly accomplished women role models from Canada, France, Japan, Russia and the United States about their lives, careers and experiences in science and engineering.


Hélène Langevin-Joliot

The mentors exchanged their real-life experiences and shared valuable advice and insight with the students. Discussions addressed the difficulties faced by women professionals in many parts of the world and the steps that can be taken to support young women who aspire to become science and engineering professionals.

What did we learn from the workshop?

- Female students have dreams and believe they can choose any career path. Still, they have many fears and concerns for the future, such as:
  - achieving a healthy work/life balance;
  - how to manage the practical aspects of life for a working woman (childcare, working long hours);
  - financing their studies.
- Students recognise the value of studying abroad but are unsure if and how to pursue these studies.
- Family support is considered to be key.
- It is essential to build self-confidence among female students.
- Teachers should be more aware of their positive influence and encourage girls to study and work in STEM fields.
- Overall, the students are highly motivated and focused, and they do not perceive major challenges to accomplishing their future goals because of their gender.

A universal comment:
“MORE FEMALE ROLE MODELS ARE NEEDED!”

Feedback from students

All of the students felt that they achieved their objectives for the workshop. They felt highly motivated to enter science and technology fields of study and had a better understanding of their future career goals. They also expanded their knowledge of how to overcome possible obstacles. They were unanimous in their views that more events such as this workshop should be held, for them, their friends and future young students.

I was shy at first, but taking part in this workshop has made me see that I can communicate with people I've never met before.

It was a great stimulation to talk with active female scientists.

The possibility is infinite with my own efforts, so I will do my best!

I recommend this workshop to my friends, especially those who haven't decided what they want to be in the future, just to expand their thoughts.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– NEA –
30 First child was born
33 Second child was born
36 Third child was born
40 Got Ph.D.
43 I was transferred to NISTEP
45 I Will back to JAXA, Hope to work agriculture
Lunar base


CHANNEL
CH1
CH2 ENGLISH

Workshop Leadership

(From left) Sachiko Yano, Asako J. Nakamura, Noriko Hosoya, William D. Magwood, IV, Shizuko Kakinuma, Aiko Shimajiri, Claudie Haigneré, Rumina Velshi, Cynthia Pederson, Tatiana Ivanova, Yeonhee Hah and Aditi Verma.

Workshop co-chairs and mentors

Claudie Haigneré: Senior Advisor to the Director-General of the European Space Agency (ESA); first French female astronaut.

Shizuko Kakinuma: Director of the Department of Radiation Effects Research at the National Institute of Radiological Sciences (NIRS), National Institutes for Quantum and Radiological Science and Technology (QST) and Unit Leader of the QST Diversity Management Unit.

Noriko Hosoya: Lecturer, Laboratory of Molecular Radiology, Center for Disease Biology and Integrative Medicine, Graduate School of Medicine, University of Tokyo.

Tatiana Ivanova: Head of the Division of Nuclear Science, Nuclear Energy Agency (NEA).

Asako J. Nakamura: Professor, College of Science, Ibaraki University.

Cynthia Pederson: Regional Administrator, United States Nuclear Regulatory Commission (NRC).

Rumina Velshi: Board Member, Ontario Energy Board; former Commissioner with the Canadian Nuclear Safety Commission.

Sachiko Yano: Visiting Researcher of the National Institute of Science and Technology Policy (NISTEP), Japanese Ministry of Education, Culture, Sport, Science and Technology (MEXT).

Aditi Verma: PhD candidate in the Department of Nuclear Science and Engineering, Massachusetts Institute of Technology (MIT).

Where do we go from here?

The mentoring workshop is a part of the type of effort that countries will require to ensure the maintenance of expertise in highly technical areas such as nuclear safety, radiological protection and other critical disciplines. The urgency of maintaining these skills has been highlighted by many NEA member countries and noted in *The Strategic Plan of the Nuclear Energy Agency: 2017-2022*. Today, we can see a significant worldwide shift in workforce demographics, with an increasing demand for trained staff in all areas related to nuclear technology, including energy applications, medicine and scientific research. To mitigate the possibility of future shortages, capacity-building efforts focusing on STEM fields need to be sustained and reinforced – particularly those aimed at females, who are significantly under-represented in many areas.

The workshop clearly highlighted a very strong desire by young women to meet with role models who have been able to pursue successful careers in science and engineering. Consideration should be given to organising more events that allow young students – both male and female – to see and talk with those who are accomplished in STEM fields. Science and engineering leaders – especially women leaders – should be vocal about why careers in science and technology are worthwhile, and they should be active in both social and traditional media in order to serve as solid role models. Today's students need to be made aware of tomorrow's wide array of STEM career options. Policymakers need to be involved to better understand and consider the next generations' needs and concerns.

The NEA is willing to support more of such events in other countries to create additional mentoring experiences for students. These workshops can provide formative experiences for students, with leaders from nuclear science and technology fields sharing their experiences and helping to answer questions such as: What challenges do women face in STEM fields? How can women ascend to leadership roles in these areas? How did mentors build successful STEM careers while pursuing full lives outside of work?

As this brochure highlights, OECD analyses demonstrate that women are, in many countries, a very underutilised asset that could help provide the skills and capabilities all countries will need to respond to an ever-changing, ever-more-complex world. Many female students would like to be a part of the solution to the world's challenges. NEA International Mentoring Workshops can help give a few young women the confidence they need to pursue their dreams.

Acknowledgements

The NEA thanks QST President Dr Toshio Hirano for his strong support for this effort, and also for the many contributors from the excellent QST staff who worked so diligently to make this programme a success.

We are also particularly grateful to Ms Aiko Shimajiri, Senior Advisor to the Minister, Cabinet Office, Government of Japan, who inspired this concept and provided her invaluable support every step of the way.

Additionally, the NEA thanks the Cabinet Office of Japan and others in the Government of Japan who supported this work and encouraged this workshop.

Finally, we thank the outstanding co-chairs, the 7 incredible mentors, the teachers and schools who participated in this activity, and most importantly, the 55 young ladies who impressed us all with their maturity and thoughtfulness, and gave us so much confidence in the future.

Mentors' words of wisdom

"This workshop was very effective in sparking interest, helping to build confidence and inspire girls to pursue aspirations."

"Believe in yourself, and you can do unbelievable things".

"Be yourself: bring out the future that is in you and keep your feminine lens."

"We know how great the need is for more role models."

"The most important ingredient for your success will be yourself."

"More women are needed in every field, especially science and engineering, and anything done towards that goal is a worthwhile endeavour."

For more information on the International Mentoring Workshop in Science and Engineering, please visit our website: oe.cd/joshikai or send an email to: mentoring@oecd-nea.org

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