[Creating a step change in the representation of girls and women in science and engineering](#)

Gender issues in education

Mathematics and science education

The 11th of February marks the celebration of the [International Day of Women and Girls in Science,](#) ***a call to tackle gender equality and a reminder of our commitment as a global community in promoting women and girls' full and equal access and participation in science and engineering.***

Solving the systemic challenges to meet the [2030 Agenda for Sustainable Development](#), will depend greatly on attracting a diverse talent pool, bringing new ideas, creativity and different perspectives. Science, technology, engineering and mathematics (STEM) and gender equality are both vital for the achievement of sustainable development and for fulfilling our commitment as a global community of "leaving no one behind".

For decades, the numbers of girls and women in science and engineering have remained remarkably stagnant. Despite great efforts, not much has changed and much still remains to be achieved, with girls and women continuing to be excluded from fully participating and accessing these fields. By failing to enable girls and women to benefit from careers in science and engineering, we are missing out on their contribution in shaping and changing the world and making our field more diverse, inclusive and reflective of the wider society.

For this reason, in 2014, the [Faculty of Engineering at University College London](#) in the United Kingdom, introduced the [50:50 Pre-19 Engineering Engagement Strategy](#).

Under this strategy, we rethought and redesigned activities and developed new programmes, recognizing a need for real change in the systems, settings and processes currently in place. At the strategy's core is the aim to strengthen and diversify the engineering workforce, encouraging young people from all backgrounds to consider career pathways both "in" and "from" engineering. Changing the stereotypical perceptions of suitable choices and careers in the minds of young people, especially for young girls, and their key influencers by raising awareness of the exciting and wide-ranging careers in engineering. These interventions focus on sustained meaningful engagement, building on pupils' engineering experiences over time, and span the entirety of primary and secondary education, offering girls and boys as young as age four an equal opportunity to experience

engineering. Implemented across our 134 STEM programmes, to date, the strategy annually connects with over 6,000 young people and a network of 529 schools with 623 UCL Engineering staff and students.

Across all our STEM engagement programmes, we insist and ensure 50% participation of girls. Requiring 50% participation of girls across all our programmes, was never just about getting a 50:50 gender balanced ratio. It is about sending a clear, strong, consistent message in the classroom, at home and to society about breaking down stereotypical threats that have created invisible barriers, holding back young girls. It is about empowering and enabling girls and women to meet their full potential, increase their resilience and confidence. As a result, our 50:50 Strategy has created a real step change in diversity, with girls' participation rates in our programmes seeing an increase from 19% to 63% in under a year, and a similar rise for Black, Asian and Minority Ethnic (BAME) pupils.

The success of our strategy is due to the adoption and implementation of the following key strategic priorities:

Promoting INCLUSIVENESS and EQUALITY

Taking an intersectional approach, our programmes are inclusive both in pupil participation and in the programme design, considering the diversity of young people and catering for a broad range of abilities and levels of understanding. Our approach includes: investment in tailored capacity building activities, raising awareness through multiple and diverse channels and an innovative applicant selection process. In this way, we have achieved wider diversity and inclusion of groups who would otherwise be excluded, due to invisible social structures.

Learning through EXPERIMENTAL ENGINEERING

Enabling young people to actively participate in authentic, open-ended projects through an experimental approach, seeing how real-world engineering is applied, while also contributing to the process. Providing substance and meaning to theoretical, abstract concepts, while developing their knowledge, skills and understanding. Inviting young people to discover the creative, environmental and humanitarian nature of engineering and its significance to society, through the cutting-edge research occurring in our labs. Encouraging young people to engage with the design-and-make process, problem-solve, and give voice to both their creativity and critical thinking.

Inspiring through RELATABLE ENGINEERING ROLE MODELS

Growing our cohort of relatable role models in engineering, via our UCL Engineering undergraduate and postgraduate students from a wide range of backgrounds. Focusing on strong female role models through the representation of women in science and engineering at all levels of primary through to secondary education. Our students share their own experiences and differing personal pathways into engineering, acting as mentors and thinking about how they might instigate their passion for STEM in a younger person. Young pupils start establishing a network of social contacts with real engineers, meeting young people like themselves, and learning from role models they can relate to.

Prioritising EARLY INTERVENTION

Prioritising early intervention, to challenge stereotypical messages forming from a very young age,

holding back girls from achieving their full potential. We introduce children as young as 4 years old to the world of engineering, enabling them to learn from and work with real engineers in academia and industry through continuous and on-going interaction, while further developing their literacy and numeracy skills as well as their understanding and knowledge of science and engineering.

Supporting teachers through PROFESSIONAL DEVELOPMENT

Recognising that high-quality classroom education relies on excellent teachers and the learning they encourage. Offering teachers high quality continued professional development opportunities as well as supporting them in the classroom with curriculum-based resources and trained experts. We support teachers to be confident and innovative when teaching STEM, creating authentic learning experiences and helping pupils develop skills they need to be successful in the 21st century and beyond.

Our lessons throughout the process of designing and implementing our programmes, are as follows:

- Develop and design activities and initiatives where teachers, youth workers, and local councils are actively involved in the process. Listening to local communities and schools when they share their ideas, experiences and needs.
- Develop toolkits and offer training courses to help teachers challenge stereotypes; understand and deal with unconscious bias and gender stereotyping.
- Rethink the current systems, processes and approaches when trying to attract a more diverse group of young people, especially more girls and women.
- Rethink the communication channels used to raise awareness, the imagery and vocabulary used. Invest in capacity-building activities through tailored programmes and design an applicant selection process that is fair and inclusive.
- Join forces together with charities, organisations, businesses, and universities in the field to maximise synergies, achieve the greatest impact, and reach out to young people from all walks of life. Don't work in silos. Form a consensus around a national campaign.
- Invest in meaningful, sustained engagement programmes that enable scientists and engineers from diverse backgrounds to act as role models and work with children from a young age, over time, to increase their science capital and understanding of STEM career pathways.

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