

Engaging young people in science and expanding their perspectives: a promising new approach

This UNESCO policy position paper on **performance-based approaches** to science education is based on its experience with the PERFORM project. PERFORM explored **the effectiveness of using the performing arts in science education** to:

- **encourage** young people to develop a **reflective** and **holistic** understanding of science; and
- **inspire** and **motivate** young people to pursue Science, Technology, Engineering and Mathematics (STEM) academically and professionally.

UNESCO's position is that educational processes which utilise the performing arts and involve direct interactions with trained early career researchers can be implemented to foster young people's engagement and broaden their perspectives on science^{1,2}.

The recommendations stemming from the PERFORM project are that policymakers should:



1. Training

- Provide funds and create mechanisms to support higher education institutions in offering **programmes of professional development** for early career researchers which include training on:
communication, performance, reflexivity, and Responsible Research and Innovation (RRI).
- **Incorporate** these elements into teacher-training curricula.
- **Encourage** early career researchers to undertake programmes of professional development through **incentives**, such as **public recognition and subsidies** for development programmes.
- **Promote and disseminate** resources to support development programmes. **Raise awareness of Responsible Research and Innovation** at all levels in higher education institutions.

2. Connections

- **Establish connections** and official channels of communication to **facilitate and encourage interactions** between early career researchers at higher education institutions, teachers in secondary schools, and science communicators, creating a **common-culture** of reflective performance-based participatory learning.
- Encourage higher education institutions to **build on the progress** that they have made with outreach and engagement, particularly with schools operating in low socio-economic contexts.

3. Curricula

- Encourage and promote **the use of performance-based pedagogy** and activities that stimulate thinking about Responsible Research and Innovation issues in school curricula, fostering students' reflective engagement with STEM.

¹ Vizzini, C., Da Silva, A., Lewis, J., Bussoletti, G. 2018. Policy recommendations on the role of early career researchers in motivational educational processes in STEM: the findings of the PERFORM project. Paris: UNESCO.

² Vizzini, C., Da Silva, A., Lewis, J., Bussoletti, G. 2018. Policy recommendations on the role of teachers in motivational educational processes in STEM: the findings of the PERFORM project. Paris: UNESCO.

The results of the PERFORM project

Our policy recommendations are based on analyses of the PERFORM project's case studies and training courses for teachers and early career researchers. The project tested the effectiveness of performance-based approaches to science learning in **two rounds of workshops** which took place in Spain, France and the UK, involving a total of 253 secondary school students.

It was found that as a result of PERFORM workshops, many of the participating students showed **increased levels of engagement and interest** in science learning, and there was an **improvement in many students' understanding** of what it means to do research and the role of science in society, aspects related to Responsible Research and Innovation values. Additionally, data suggest that the involvement of **early career researchers** in the workshops was a **key element of success**, allowing students to deconstruct stereotypes about science and scientists.

Involving early career researchers

Recent studies suggest that young people are influenced by negative stereotypes and problematic cultural images of scientists³. We recommend that schools should include trained early career researchers, alongside science communicators and teachers, in performance-based science education activities, because **interacting directly** with young people, early career researchers can help to **reduce young people's stereotypes** and preconceptions about scientists, raise important wider questions relating to Responsible Research and Innovation, and 'humanise' science and research.

UNESCO targets early, rather than mid or late career researchers, because it is expected that with a greater proximity in age between students and researchers, it is more likely that students will be able to **personally identify and connect** with researchers. Early career

researchers may also have more opportunities to have a lasting effect on their organisations and contribute to **systemic change**, often having a higher level of engagement within their organisations.

Responsible Research and Innovation values

The policies recommended here, and the PERFORM project more broadly, reflect and support the European framework for Responsible Research and Innovation (RRI). This framework seeks to align research and innovation with **broader social values**, emphasising the importance of public engagement, gender equality, science education, ethics and transparency in research, and responsible political governance of research and innovation.

In line with these values, the recommendations of this policy position paper promote early career researchers' public engagement with young people, an awareness of ethics and transparency in research among researchers and young people, and advocate learning processes which contextualise science into social and human contexts.

Opportunities to innovate: social context

According to the European Centre for the Development of Vocational Training⁴, STEM vocations are among the top five 'skill shortage professions' across the EU Member States (CEDEFOP, 2016). There is thus an **opportunity to create policies** that foster young people's engagement with STEM. There are also opportunities to innovate in the way in which information is transferred in the classroom: in traditional approaches, the transfer is unidirectional and vertical from above, but recent literature shows that educational approaches that actively involve students enhance their engagement in science⁵. Taking these opportunities, the policies recommended here advocate active and participatory learning processes to enhance young people's engagement, with strategies to reduce their stereotypes.

³ Ruiz-Mallen, I., Escalas, M.T. (2012), 'Scientists Seen by Children: A Case Study in Catalonia, Spain', *Science Communication*, 34 (4), 520-545.

⁴ The European Centre for the Development of Vocational Training (CEDEFOP) (2016), 'Skill shortages in Europe: Which occupations are in demand - and why',

available at: <http://www.cedefop.europa.eu/en/news-and-press/news/skill-shortages-europe-which-occupations-are-demand-and-why> (Accessed: 31 October 2018).

⁵ NFER (2011), 'Exploring young people's views on science education', report to the Wellcome Trust.

