CERN Science Gateway – New Education Labs

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Abstract. CERN is the world's largest particle physics laboratory. It's the home of the most powerful particle accelerator in the world, which enables scientists to study the fundamental interactions between elementary particles. CERN also offers a unique environment for learning and training. CERN Science Gateway, a brand-new science education and outreach centre that opened on 7 October 2023, offers visitors a rich and authentic out-of-school learning experience. This poster presents new lab workshops developed for CERN Science Gateway, which bring authentic STEM challenges to learners as young as 5 years.

Why visit CERN Science Gateway?

The study of particle physics, including topics like elementary particles, fundamental interactions, and charges, is explicitly included in numerous physics curricula [1]. Yet, even in cases where particle physics may not be directly mentioned in the curriculum, the activities at CERN Science Gateway offer ample opportunities for integration. Students have the chance to delve into experimental methods and scientific modelling in authentic research contexts [2].

A trip to CERN provides learners the opportunity to observe the epicentre of pioneering scientific breakthroughs, sparking their curiosity and enhancing their interest in the science. It also has the potential to motivate them towards careers in science, technology, engineering, and mathematics (STEM). Engaging directly with CERN's community of scientific volunteers, who are instrumental in conducting educational initiatives, allows students to experience the enthusiasm and commitment of professionals in the field and explore a variety of scientific careers. Moreover, as an international entity that houses a collaborative network of global scientists and researchers, CERN underscores the critical role of international cooperation in science, promoting a worldly outlook among students.

The iconic building of CERN Science Gateway was designed by the world-renowned Renzo Piano Building Workshop, with support from Brodbeck–Roulet architectes associés, and its design embraces the industrial feel of CERN. It includes interactive hands-on exhibitions, science shows, and lab workshops, and it also serves as the starting point for guided tours to CERN's research facilities.

New Education Labs

This poster showcases the unique experience of working at the world's largest physics laboratory through an immersive lab workshop program designed to allow participants to discover their inner scientist. Participants explore their scientific curiosity and acquire hands-on experience in conducting scientific investigations. The workshops encompass a broad spectrum of topics, including the fundamental principles of particle detection, robotics applications in scientific research, and the overarching nature of science itself. Tailored to suit varying educational levels, the program offers workshops specifically designed to cater to the diverse ages and interests of students, promoting an inclusive and enriching learning environment for aspiring scientists. The current offer includes the following 10 workshops:

- Slimy detectors (5–7 years)
- Programming with Ozobots (5–7 years)
- Seeing the invisible (5–15 years)
- Magnet challenge (8–12 years)
- LEGO robotics challenge (8–15 years)
- Power of air (8–15 years)
- Cloud chamber (16–19 years)
- Electron beams (16–19 years)
- Superconductivity (16–19 years)
- Positron-emission tomography (16–19 years)

All workshops start with authentic STEM challenges that are related to the science and technologies at CERN. The education labs at CERN Science Gateway accommodate a multinational audience, offering workshops in up to 30 languages based on guide availability. Furthermore, the workshop durations are thoughtfully tailored to the participants' age groups, with approximately 45 minutes dedicated to children aged 5–15 years and 90 minutes for older students aged 16–19 years, ensuring an age-appropriate depth of exploration and learning [3].

The impact of lab workshops on participants

To evaluate the guides facilitating lab workshops and to get insights into the impact of workshops on participants, we conducted a small study with families and individual visitors taking part in the workshop "Seeing the invisible". After the 45-minute workshops, participants filled out a short online questionnaire in French or English, which assessed participants' perception of the guides as well as their enjoyment, curiosity, image of scientists and the Net Promoter Score (NPS). In a pilot phase, we used a 6-level scale for questions such as "Did you enjoy the workshop?" (0 – not at all, 5 – very much). However, since the scales were all saturated and to keep the answer options the same for all questions including the Net Promoter Score, we extended all answer options to 11-level scales. Still, results confirm extremely high levels of satisfaction across all age groups and a remarkable Net Promoter Score above 80%.

References

[1] A. Kranjc Horvat et al., What Does the Curriculum Say? Review of the Particle Physics Content in 27 High-School Physics Curricula, *Physics* **4** (2022) 1278–1298. DOI: 10.3390/physics4040082

[2] J. Woithe, CERN Science Gateway: a guide for teachers, *Science in School* **66** (2024).

[3] More information about lab workshops at CERN Science Gateway https://visit.cern/lab