CERN Science Gateway
Education Labs & Science Shows

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on behalf of the Science Gateway Education Team (sciencegateway.education@cern.ch)
"I used to wish to become a princess when I grew up. But recently, I've changed my mind. I've seen how interesting sciences and flying to space are. As a princess, I'd have to marry a prince, stay at home, and take care of the children. So, I've decided that instead of becoming a princess, I'd rather be an astronaut."

4-year-old girl talking to guide after an open workshop
Science Gateway Education Activities

Labs
(Re-) Discover your inner scientist

Science Shows
Explore the stories of discoveries

Online Learning
Engage online to find out more

CERN Science Gateway Education | sciencegateway.education@cern.ch
Science Shows

5 different shows, 30-45 min, 200-400p

- Journey Through a Detector
- Proton Express
- Mysteries of Matter
- Seize the Data
- Science of Magical Parties

2-3 shows per day

First 9 months: 200 shows, 18k visitors (240k visitors in total at Science Gateway)
Audience feedback shows

Shows: Proton Express & Journey Through a Detector
N = 98; 15 shows \( \rightarrow \) <10%
11-level scale: 0 - not at all to 10 - very much, converted to %, \( \pm 1 \) Standard Deviation

<table>
<thead>
<tr>
<th>Question</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much did you like today's show?</td>
<td>94% (( \pm 10% ))</td>
</tr>
<tr>
<td>Are you curious to learn more about the show topic?</td>
<td>86% (( \pm 17% ))</td>
</tr>
<tr>
<td>Did the workshop help you get a better understanding of what we do at CERN?</td>
<td>90% (( \pm 19% ))</td>
</tr>
<tr>
<td>Was the presenter engaging?</td>
<td>96% (( \pm 11% ))</td>
</tr>
<tr>
<td>Would you recommend this science show to friends and family?</td>
<td>92% (( \pm 8% ))</td>
</tr>
</tbody>
</table>

Net Promoter Score: 77

Creators of NPS (Bain & Company) suggest:
- Above 0 is good,
- Above 20 is favourable,
- Above 50 is excellent, and
- Above 80 is world class.
Lab Workshops
Lab workshops

10 different lab workshops, 45-90 min, 24p

First 9 months: 785 workshops, 17k visitors

<table>
<thead>
<tr>
<th>Age group</th>
<th>% Visitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7</td>
<td>4%</td>
</tr>
<tr>
<td>8 to 12</td>
<td>7%</td>
</tr>
<tr>
<td>13 to 15</td>
<td>5%</td>
</tr>
<tr>
<td>16 to 19</td>
<td>35%</td>
</tr>
<tr>
<td>20 to 29</td>
<td>1%</td>
</tr>
<tr>
<td>30+</td>
<td>5%</td>
</tr>
<tr>
<td>Open workshops</td>
<td>42%</td>
</tr>
</tbody>
</table>
## Audience feedback workshops

### Seeing the invisible, Open Workshop

**N = 81** (43 FR, 38 EN)

11-level scale: 0 - not at all to 10 - very much, converted to %, ± 1 Standard Deviation

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you enjoy the workshop?</td>
<td>94% (±12%)</td>
</tr>
<tr>
<td>Are you curious to learn more about the workshop topic?</td>
<td>89% (±18%)</td>
</tr>
<tr>
<td>Was the duration of the workshop appropriate?</td>
<td>91% (±16%)</td>
</tr>
<tr>
<td>Did the workshop help you get a better understanding of what scientists do?</td>
<td>92% (±12%)</td>
</tr>
<tr>
<td>Was the guide engaging?</td>
<td>95% (±10%)</td>
</tr>
<tr>
<td>Was the guide friendly?</td>
<td>97% (±7%)</td>
</tr>
<tr>
<td>Was it easy to understand the explanations of the guide?</td>
<td>94% (±11%)</td>
</tr>
<tr>
<td>Would you recommend this lab workshop to friends and family?</td>
<td>96% (±9%)</td>
</tr>
</tbody>
</table>

**Net Promoter Score: 87**
New database for educational resources at CERN

- Collection of educational resources produced by different education and outreach teams at CERN
- Includes scripts, design files and educational support material for workshops and shows that are easy to replicate
- visit.cern/resources
- If you have specific questions: please don’t hesitate to contact us

Particle Detectives: A low-cost portable science show
Join us as ‘particle detectives’ to explore particles and their interactions, from molecules to CERN.
Age group: 13-15  16+

Scattering boxes - Seeing the invisible
Explore how balls interact with a hidden structure to develop a scientific model.
Author: CERN PER team
Age group: 5-12  13-15  16+

Balloon Hovercraft - Power of Air
Explore how air is able to help us lift heavy things by reducing friction.
Author: CERN PER team
Age group: 5-12  13-15
Meet-a-scientist effect

- Talking to scientists can significantly increase students STEM career aspirations (Fadigan & Hammrich, 2004; Mills & Katzman, 2015) and it can change their perception of scientists (Houseal et al., 2014; Rennie & Howitt, 2015; Woods-Townsend et al., 2016).

- Students' perception of scientists as workshop facilitators is a strong predictor of many educational outcomes such as interest, curiosity, enjoyment, physics self-beliefs, perceived cognitive activation (basically all except conceptual understanding) (Woithe et al., 2020).

- Quantitative instruments to measure students’ beliefs about scientists (e.g., Garriot et al., 2017; Wyer et al., 2010), e.g. statements about interpersonal & professional competencies.

- Example: Results from week-long high-school student camp at CERN (N=25)
  - 6-level scale completely disagree (1) to completely agree (6), converted to % scale.
Physicists working at research institutes:

1. are normal.
2. have good social skills.
3. have many friends.
4. like sports.
5. have an active social life.
6. have various fashion styles.
7. are honest.
8. are especially intelligent.
9. are highly focused.
10. are work oriented.
11. are competent.
12. are creative.
13. enjoy their work.
14. work together in teams.
15. are self-confident.

Significant pre-post differences (t-tests, p<0.002)
Large effects ($d_C = 0.9-1.2$)
Thank you for your attention.

Questions?
References


The regular everyday work of a physicist working at a research institute involves:

1. performing experiments.
2. understanding experimental data.
3. developing new research ideas.
4. supervising students.
5. raising funds for research projects.
6. writing down measurement data.
7. meeting colleagues from other departments.

The diagram shows the percentage of time spent on each activity, comparing pre and post research periods.