Focus Group 1

THE HIGGS BOSON
Curriculum & classroom connections

So we found a new particle!
So we proved light is made of particles

\[ E(\nu, T) = \frac{8\pi\hbar\nu^3}{c^3} \frac{1}{e^{\hbar\nu/(kT)} - 1} \]

\[ E_{\text{photon}} = h\nu \]

Photoelectric effect

So we proved light is made of particles

700 nm 1.77 eV
550 nm 2.25 eV
300 nm 3.1 eV

\[ v_{\text{max}} = 6.22 \times 10^5 \text{ m/s} \]
Key ideas

- Standard model and the Higgs boson

- Mathematical model predicted the particle before it was experimentally discovered
Key ideas

- In particle physics there is a probability that something happens, so we have to collect a lot of events.

- Data analysis / statistics
Potential students’ conceptions & challenges

- Models
Potential students’ conceptions & challenges

• Models

• Physics is an exact Science!!!
Potential students’ conceptions & challenges

- Models
- Physics is an exact Science!!!
- Statistics and data analysis
Potential students’ conceptions & challenges

• Models
• Physics is an exact Science!!!
• Statistics and data analysis
• Graph Interpretation
Helpful Materials

- The introduction of the Higgs boson detection needs not only a pedagogical approach but also needs the access to facilitating material and resources. Some of the useful materials could be:
  - Cartoons
  - OpenData, Quarknet.org
  - Coding Programs: Jupyter and Python
Masterclass & Other Resources