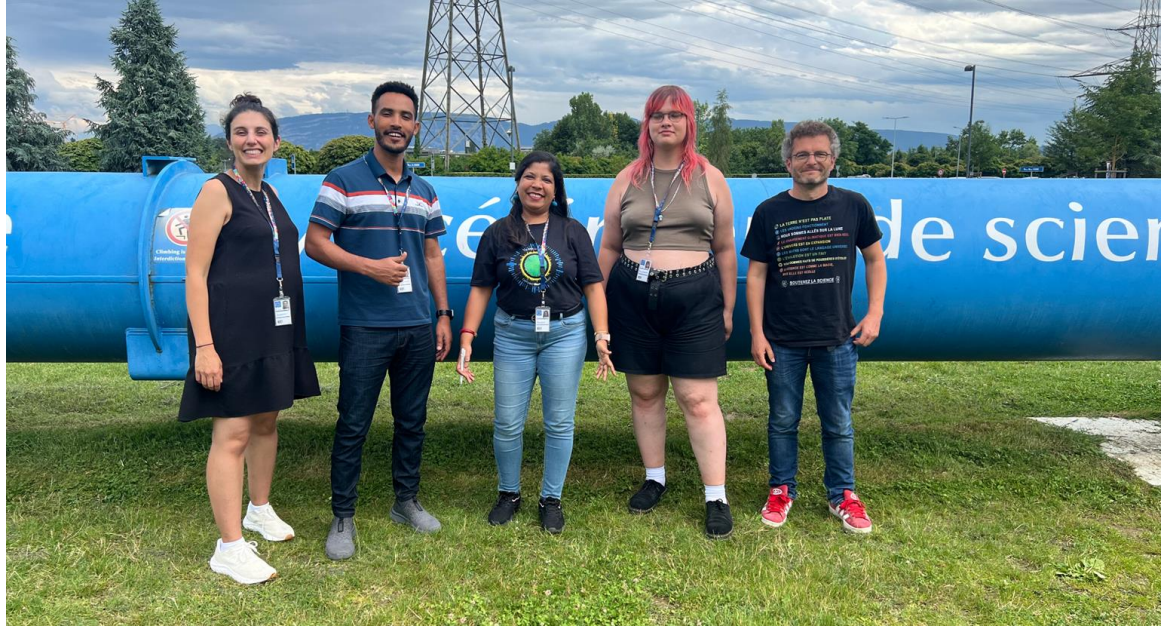# Engineering at CERN

HST2024 Study Group 1

Sue (AUS ᴀᴜ) | Alene (ETH ᴇᴛ) | Shreya (IND ɪɴ) | Max (LAT ʟᴠ) | Stéphane (FRA ꜰʀ)

Curriculum & Classroom Connections

PROBLEM: The lunch lines in R1 are too long.

- Different curricula, it's unanimous that Engineering works well with Physics in fostering the *skills* required of engineering

(now, back to our problem…)

- ○ Problem solving (incl. models & simulations)
- ○ Collaboration / teamwork
- ○ Resilience in learning (i.e. trying again and again when things "fail")
- ○ Providing skills & links for when they leave school (i.e. feasibility, practicality etc)

Other benefits:

- student-centred learning environment (vs a more lecture based environment)

- provides opportunities for students to work through the engineering/design cycle

- e.g. an engineering based task that links to particle physics in the classroom could be: Design a Simple Particle Detector

Balance these 6 nails on the one without letting them touch the wood
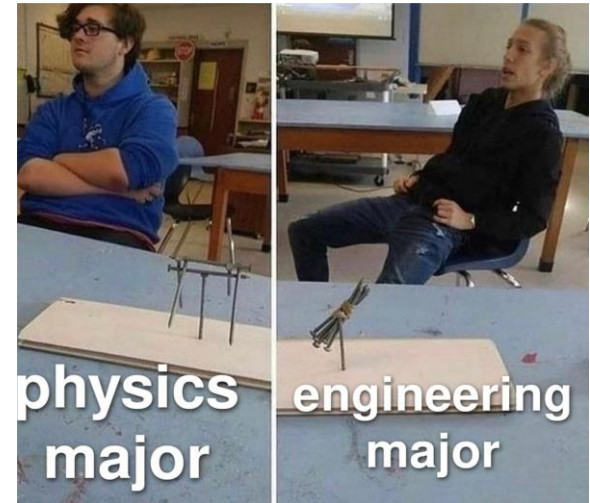
Key Ideas

application of knowledge

collaboration

specialisation

problem solving

Potential Students' Conceptions & Challenges

2:00

Challenges

❖ *Resilience*

❖ *Lack of proper correlation between learning, application and results.*

❖ *Lack of time to repeat / practice*

❖ *Lack of prior knowledge and interest in the field*

❖ *Lack of access to modern technology and learning process*
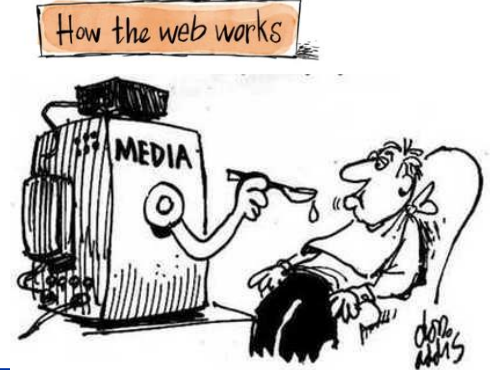
Solutions

❖ *Delivering clear contents, skills and results*

❖ *Provide them with the opportunity to analyze problems and apply the theoretical knowledge in a practical settings.*

❖ *Provide them with many opportunities to "fail" and then learn from those "failures".*

❖ *Pre and post-assessment*

Physicists

Engineers
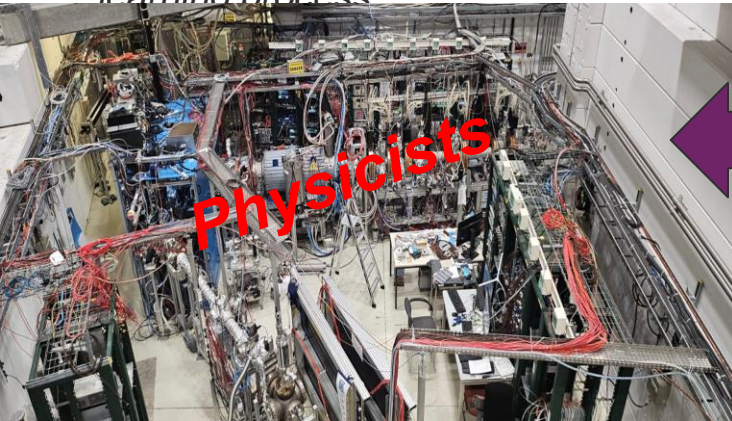
Useful Material & Resources

2:00

Ref:
https://pngtree.com/freepng/inclusive-education-vector_11399085.html
https://ctnewsjunkie.com/2023/01/23/op-ed-its-time-to-make-media-literacy-education-mandatory/
http://ateachersquest.weebly.com/media-literacy.html

Best Practice Example

GOAL: Design a circular accelerator with a beam of 7 TeV

EXPERIMENT: Measure the magnetic field created by a solénoid.

RESULTS: About B=2mT for I=3 A

CONCEPTS INTRODUCED: Physics about interaction between charged particles and magnetic fields (bending radius average 10 000km!)

RESEARCH: Comparison with LHC

IMPROVEMENTS:

- Need superconductivity (research for how)
- Number of magnets
- How accelerating particles?
- Energy cost
- Produce a prototype

LEARNING OUTCOMES:

- Do physics
- Understand that engineering covers many skills (Dynamics, electricity, mathematics, modelisation…)

One way in which our thinking has changed…

- Don't try to understand everything, try to understand according to your own capability
- try different classroom strategies which best fits you according to your context
- The importance of collaboration
- the impact that the research done at CERN has on the wider scientific (and non-scientific) community
- Big discoveries in Physics did not stop 100 years ago - rather they are ongoing

Free flow, highlights, snapshots…

- Being out of our comfort zone was actually good and learnt so much
- Witnessing a range of people with such varied backgrounds
- We have learnt so much - from the presenters and workshops but also from each other

Engineers when they realize that their field doesn't exist without Physics.

This is why physics teachers should not be given playground duty.