Physics Education Laboratory Lecture 01

Francesco Longo • 23/09/2024

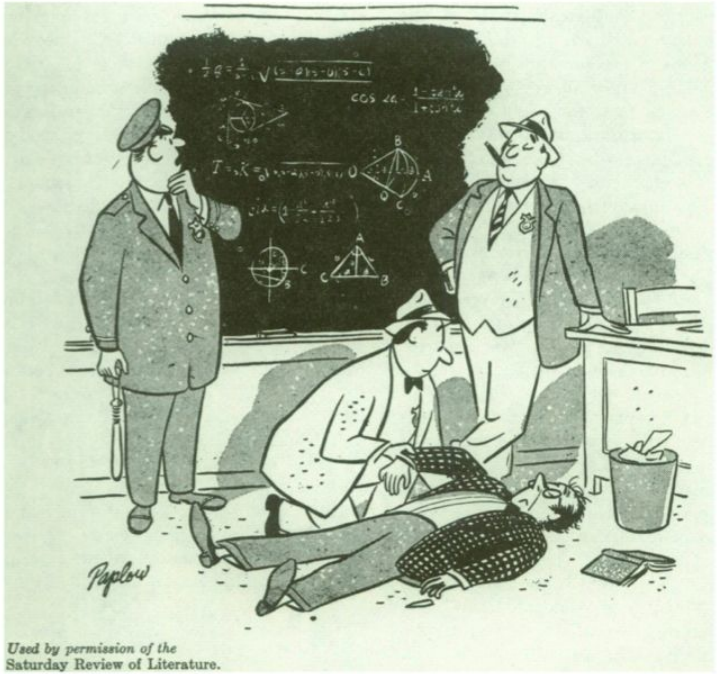
Summary

Course Overview

Course Topics - Lesson Outline

Course Final Exam

Course overview



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Saturday Review of Literature.

"Maybe he knew too much."

Integrated mathematics and physics

MALCOLM SMITH

The Mathematics Teacher , December 1955, Vol. 48, No. 8 (December 1955), pp. 535-537

https://www.jstor.org/stable/27955013

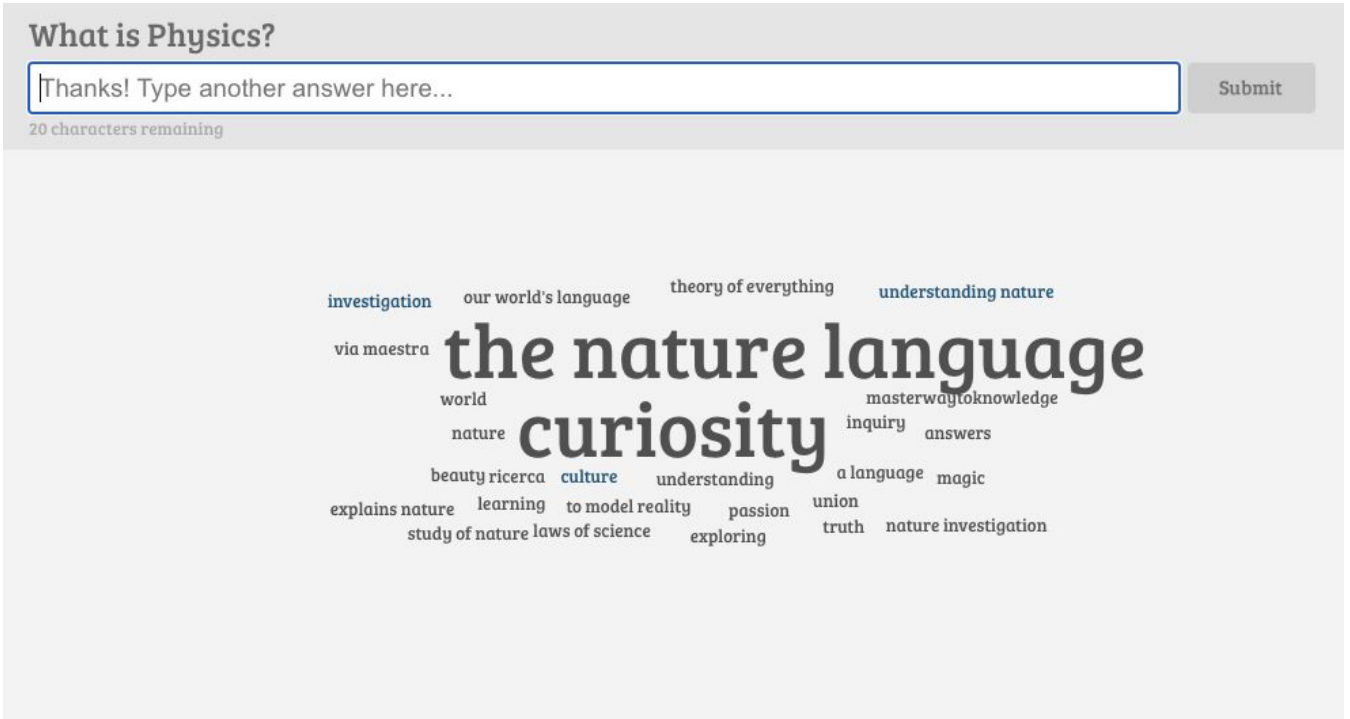
https://answergarden.ch/4183600

https://answergarden.ch/4183601

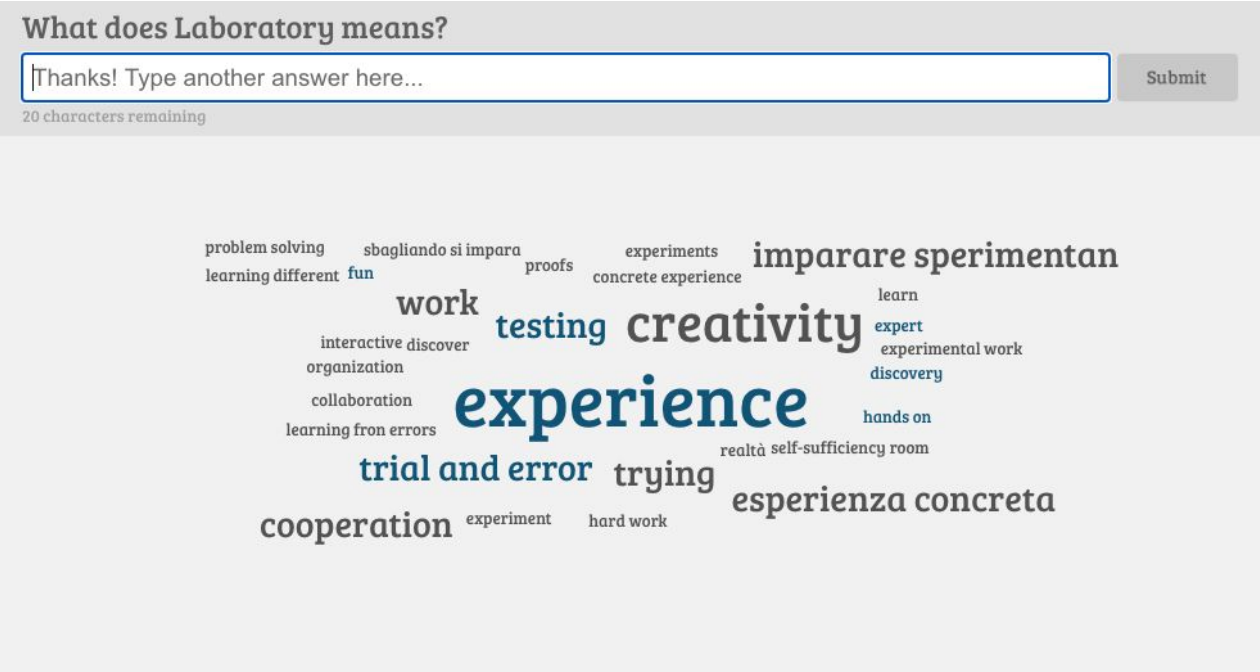
https://answergarden.ch/4183602

Brainstorming 2023

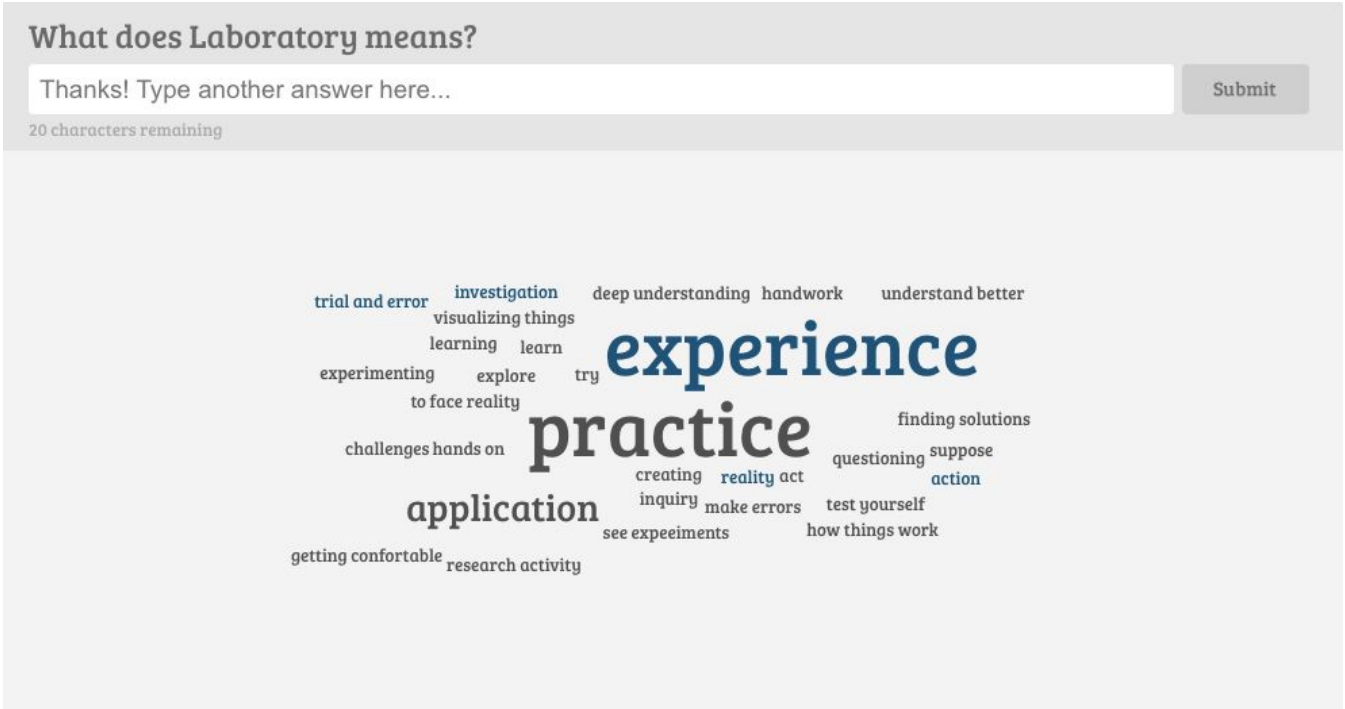
Brainstorming 2024



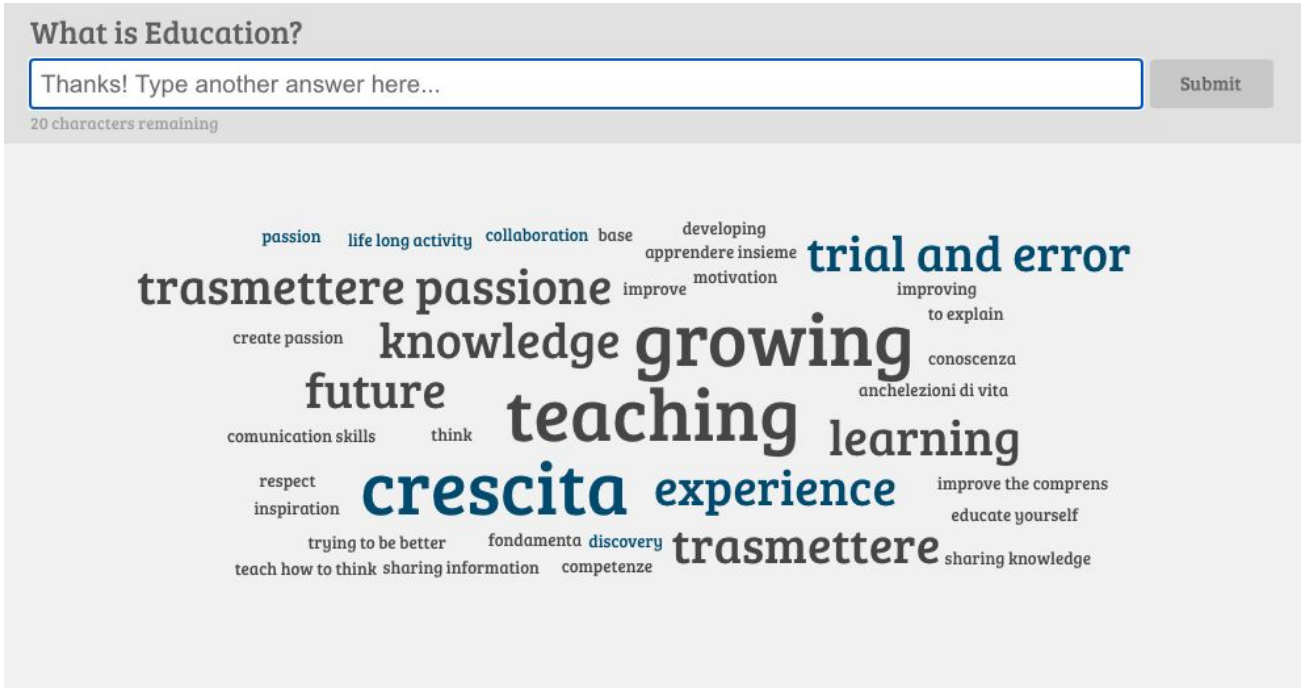
Brainstorming 2023



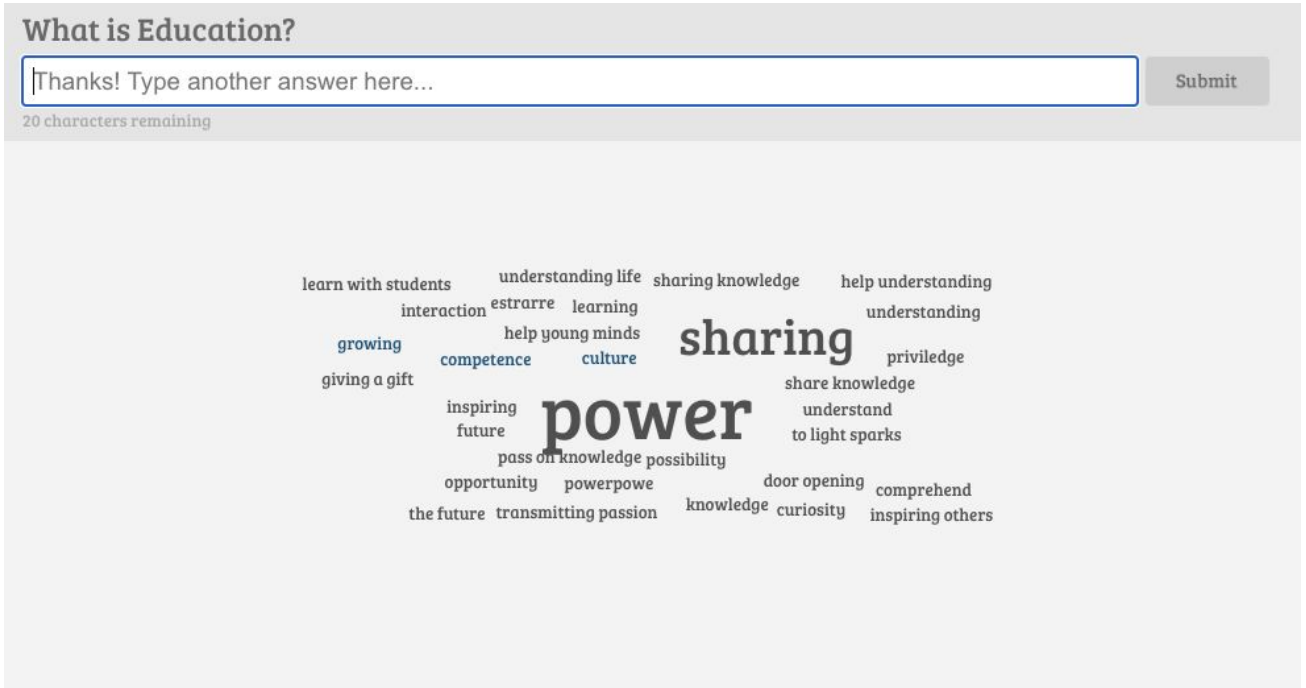
Brainstorming 2024



Brainstorming 2023



Brainstorming 2024



Course Topics

Teacher's perspectives

- Subject Matter Knowledge (SMK) or Content Knowledge (CK)
- Pedagogical Knowledge (PK)
- Pedagogical Content Knowledge (PCK)
- Content Knowledge for Teaching (CKT)
- Cultural Content Knowledge (CCK)
- Technological Pedagogical Content Knowledge (TPCK)

Student's perspectives

- How students learn
  - Cognitive skills
  - Meta-cognitive skills
  - Assessments
  - Attitude towards physics

Physics perspectives

- Epistemological point of view/development:
  - How Physics works
  - How Physics knowledge is structured
  - How Physicists work

Lesson outline

Observation

- Video - lessons

Discussion

- Teacher's perspective
- Student's perspective
- Discipline's perspective

Conceptual Frame

- Content's details
- Main conceptual difficulties

Teaching Approach

- Methodologies
- Educational

Laboratory

- Educational experiments
- Case studies

Content Details
Teaching Approach

Main topics

Kinematics
Dynamics
Energy
Fluidodynamics
Calorimetry/thermodynamics
Optics
Electrostatics
Magnetism
Electromagnetism
Quantum Mechanics
Special & General relativity

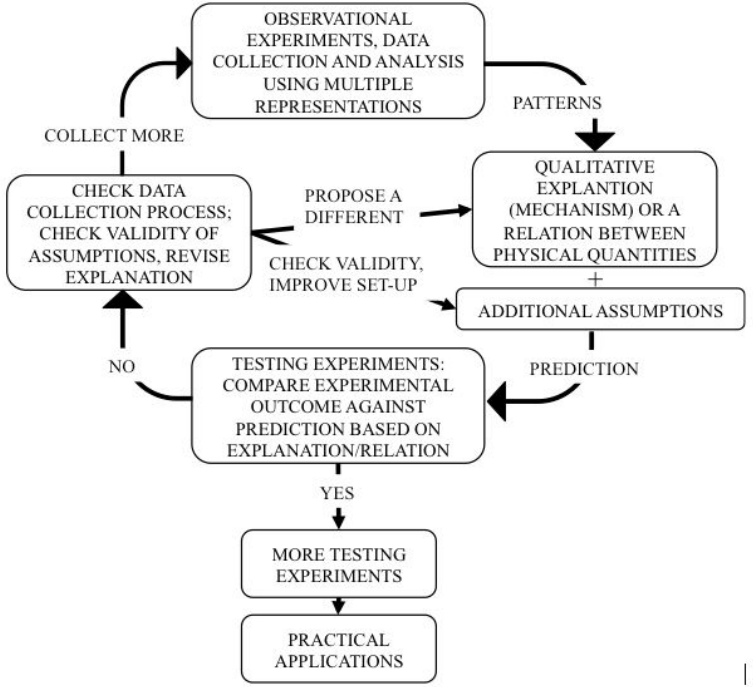
Useful education tools in PER

Early Physics
Multiple Representations in Physics
Historical approaches
Problem-solving; Jeopardy problems
Physics of everyday Thinking
Project Based Education
Modelling instruction
Simulation for Educational Physics
ISLE - Investigative Science Learning Environment
IBSE - Inquiry Based Science Education
Bayesian updating method
On line educational tool-kit

The ISLE approach

ISLE PHYSICS

Helping students learn to do science



Course Final Exam

1. Choose a subject
2. Choose a teaching approach
3. Discuss the adopted teaching approach based on PER literature search
4. Create your own educational case
5. Elaborate a report
6. Prepare a laboratory to test it

Lecture schedule

1. Monday 17-19 - Aula 5B H2bis
2. Wednesday 17-19 - Aula 5B H2 bis