
Physics Education Laboratory Lecture 01

Francesco Longo • 25/09/2023

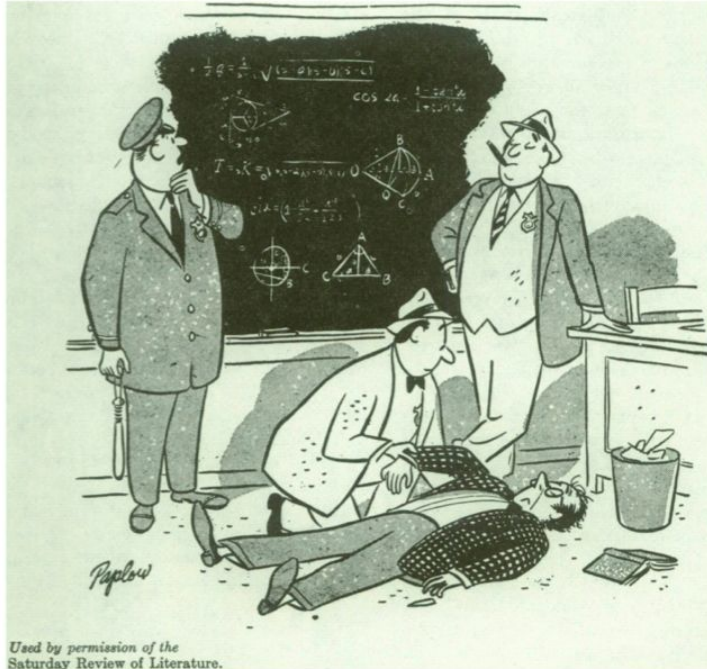
Summary

Course Overview

Course Topics - Lesson Outline

Course Final Exam

Course overview



"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/3805073>

<https://answergarden.ch/3805074>

4

<https://answergarden.ch/3805075>

Brainstorming

What is Physics?

Thanks! Type another answer here...

Submit

20 characters remaining

A word cloud of physics-related terms. The most prominent words are 'understanding nature', 'discovery', 'curiosity', 'nature', and 'fun'. Other visible words include 'mathematics', 'laws of nature', 'explore', 'science', 'reality', 'applied mathematics', 'learning', 'theory', 'the universe', 'everything', 'hard', 'experience', 'scoperta', 'math', 'newton', 'simplicity', 'answers', 'future', 'sofference', 'soffrenze', 'questions', 'passion', 'progress', 'foundation of the wo', 'modeling reality', and 'hypothesis'.

Brainstorming

What does Laboratory means?

Thanks! Type another answer here...

Submit

20 characters remaining

A word cloud of brainstorming ideas for 'Laboratory'. The words are arranged in a roughly circular pattern. The most prominent words are 'experience' (largest, dark blue), 'creativity' (large, dark blue), 'testing' (medium, dark blue), and 'trial and error' (medium, dark blue). Other words include 'imparare sperimentan', 'work', 'concrete experience', 'hands on', 'esperienza concreta', 'learning from errors', 'collaboration', 'organization', 'interactive discover', 'learning different', 'fun', 'problem solving', 'sbagliando si impara', 'proofs', 'experiments', 'learn', 'expert', 'experimental work', 'discovery', 'realtà self-sufficiency room', 'experiment', and 'hard work'.

problem solving sbagliando si impara experiments imparare sperimentan
learning different fun proofs concrete experience learn
work testing creativity expert
interactive discover organization experimental work
collaboration experience discovery
learning from errors hands on
trial and error trying realtà self-sufficiency room
cooperation experiment hard work esperienza concreta

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)

Course Topics

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 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

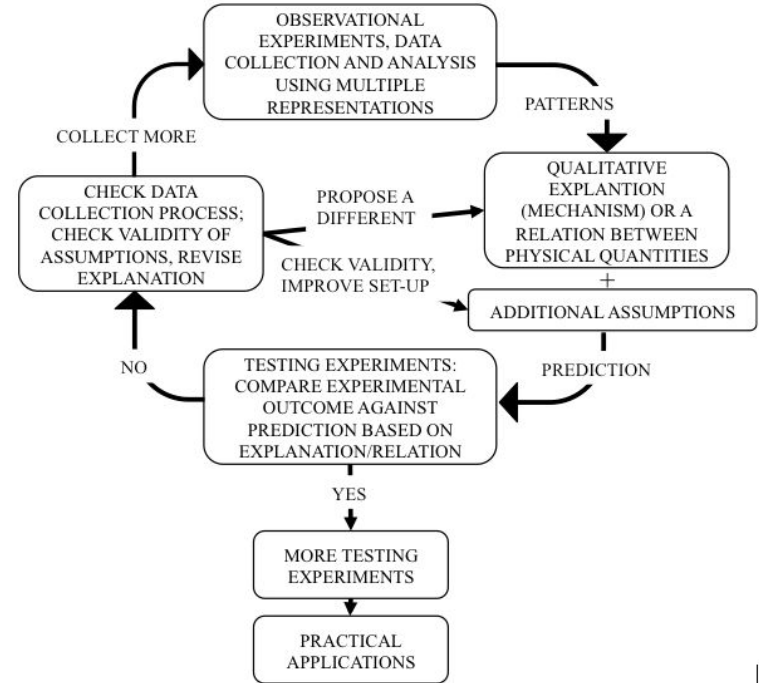
On line educational tool-kit

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. Prepare a laboratory to test it
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Lecture schedule

1. Monday 17-19 - Aula 5C H2
2. Wednesday 11-14 - Aula 4C H2

Observing teaching videos

<https://www.youtube.com/playlist?list=PLAA7AA6B0E433653C>

<https://www.youtube.com/watch?v=CDEDBXuWYvo>

<https://www.youtube.com/watch?v=AsNxXS3kYho>

<https://www.youtube.com/watch?v=kxHdVw-mh24>

<https://www.youtube.com/watch?v=282D-YkMxyl>

<https://forms.gle/hj6AGe14vGGuwzoig>
