
Physics Education Laboratory Lecture 01

Francesco Longo • 23/09/2024

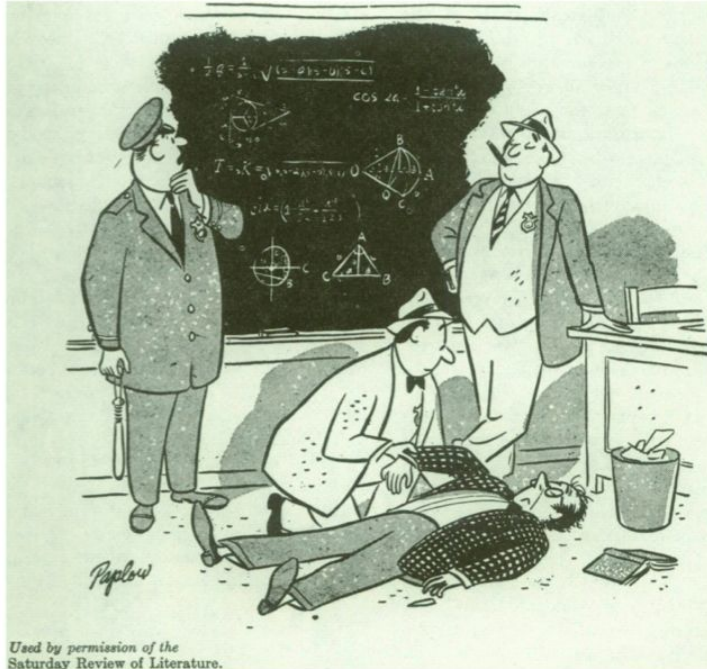
Summary

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://answer garden.ch/4183600>

<https://answer garden.ch/4183601>

<https://answer garden.ch/4183602>

Brainstorming 2023

What is Physics?

Thanks! Type another answer here...

Submit

20 characters remaining

A word cloud visualization of brainstorming responses for the question 'What is Physics?'. The words are arranged in a roughly rectangular shape, with the most prominent words being 'understanding nature', 'discovery', and 'curiosity'. Other visible words include 'science', 'nature', 'fun', 'experience', 'mathematics', 'laws of nature', 'explore', 'reality', 'applied mathematics', 'learning theory', 'the universe', 'everything hard', 'scoperta', 'math', 'newton', 'simplicity', 'answers', 'future', 'sofference', 'soffrenze', 'questions', 'passion', 'progress', 'foundation of the wo', 'modeling reality', and 'hypothesis'.

mathematics laws of nature explore understanding science
reality applied mathematics
learning theory
the universe understanding nature
everything hard
experience nature fun
future
sofference discovery curiosity
soffrenze questions passion progress
hypothesis foundation of the wo modeling reality

Brainstorming 2024

What is Physics?

Thanks! Type another answer here...

Submit

20 characters remaining

A word cloud visualization of brainstorming results for the question 'What is Physics?'. The words are arranged in a roughly circular pattern, with the most prominent words being 'the nature language' and 'curiosity'. Other visible words include 'investigation', 'our world's language', 'theory of everything', 'understanding nature', 'via maestra', 'world', 'masterwaytoknowledge', 'nature', 'inquiry', 'answers', 'beauty', 'ricerca', 'culture', 'understanding', 'a language', 'magic', 'explains nature', 'learning', 'to model reality', 'passion', 'union', 'study of nature', 'laws of science', 'exploring', 'truth', and 'nature investigation'.

investigation our world's language theory of everything understanding nature
via maestra the nature language
world masterwaytoknowledge
nature curiosity inquiry answers
beauty ricerca culture understanding a language magic
explains nature learning to model reality passion union
study of nature laws of science exploring truth nature investigation

Brainstorming 2023

What does Laboratory means?

Thanks! Type another answer here...

Submit

20 characters remaining

A word cloud visualization of the brainstorming responses. The words are arranged in a roughly circular pattern, with 'experience' being the largest and most central word. Other prominent words include 'creativity', 'testing', 'work', 'trial and error', 'trying', 'esperienza concreta', 'imparare sperimentan', and 'cooperation'. Smaller words include 'problem solving', 'learning different', 'fun', 'sbagliando si impara', 'proofs', 'experiments', 'concrete experience', 'learn', 'expert', 'experimental work', 'discovery', 'hands on', '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

Brainstorming 2024

What does Laboratory means?

Thanks! Type another answer here...

Submit

20 characters remaining

A word cloud visualization of brainstorming results for the question 'What does Laboratory means?'. The words are arranged in a circular pattern, with 'experience' and 'practice' being the most prominent. Other visible words include 'application', 'investigation', 'deep understanding', 'handwork', 'understand better', 'visualizing things', 'learning', 'learn', 'experimenting', 'explore', 'try', 'to face reality', 'challenges hands on', 'creating', 'reality act', 'questioning', 'suppose', 'action', 'inquiry', 'make errors', 'test yourself', 'how things work', 'see expeiments', 'getting comfortable', and 'research activity'.

trial and error investigation deep understanding handwork understand better
visualizing things
learning learn **experience**
experimenting explore try
to face reality
challenges hands on **practice** finding solutions
creating reality act questioning suppose
inquiry make errors test yourself action
application
see expeiments how things work
getting comfortable research activity

Brainstorming 2023

What is Education?

Thanks! Type another answer here...

Submit

20 characters remaining



Brainstorming 2024

What is Education?

Submit

20 characters remaining

A word cloud visualization of the brainstorming responses. The words are arranged in a roughly circular pattern, with 'power' and 'sharing' being the most prominent. Other visible words include 'learning', 'understanding', 'knowledge', 'future', 'inspiring', 'pass on knowledge', 'possibility', 'opportunity', 'power', 'door opening', 'comprehend', 'the future', 'transmitting passion', 'knowledge', 'curiosity', 'inspiring others', 'to light sparks', 'understand', 'share knowledge', 'privilege', 'giving a gift', 'competence', 'culture', 'help young minds', 'interaction', 'estrarre', 'help understanding', 'learn with students', 'understanding life', 'sharing knowledge', 'growing', and 'giving a gift'.

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 & 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

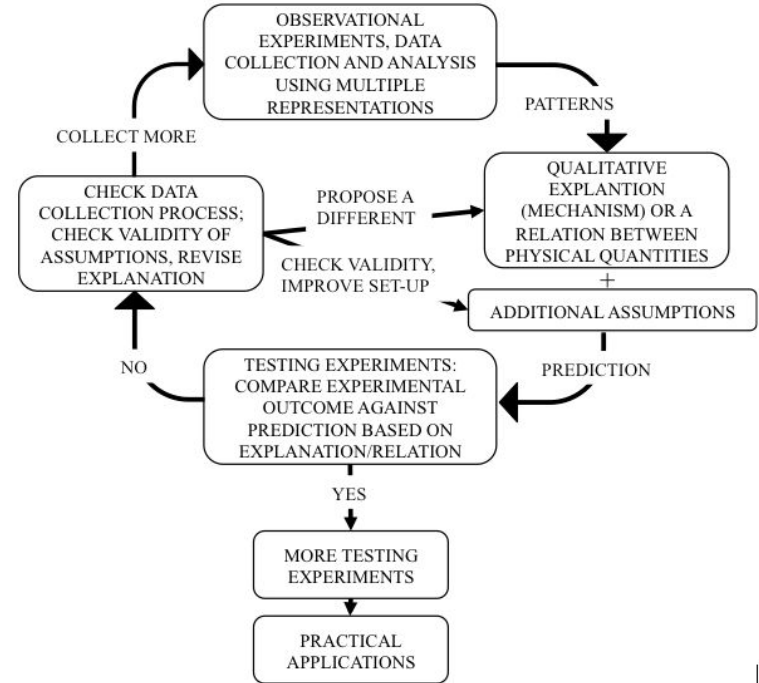
On line educational tool-kit

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
