November 22, 2018

Innovative Technology Use in STEM Teacher Education

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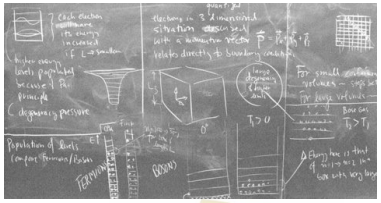
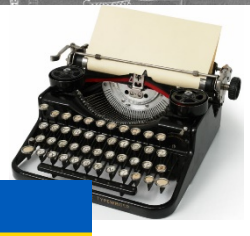
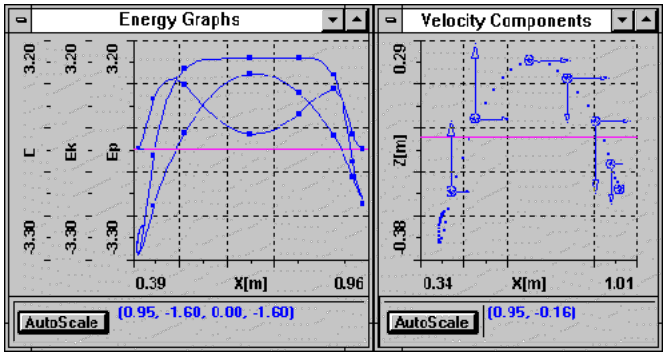
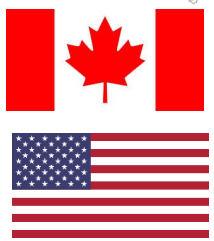
My Math & Science Education Trajectory







V-scope



University of British Columbia

16,188 international students from 140+ countries!

UBC Facts

- Public Uni. Est 1908
- 2 campuses: Vancouver & Kelowna
- ~65,000 students
- Academic staff: 5470+
- Acceptance rate: 64%
- Intern. ranking – 34th (U.S. News & World Rep. 2018)

Teacher Education in Canada

PROMOTING RESEARCH-BASED PHYSICS TEACHER EDUCATION IN CANADA: BUILDING BRIDGES BETWEEN THEORY AND PRACTICE

BY MARINA MILNER-BOLOTIN

More than 25 years ago, Lee S. Shulman, then president of the American Educational Research Association [1], challenged us to re-think how we prepare teachers through focussing on *Pedagogical Content Knowledge* (PCK) - the knowledge of content and content-specific pedagogies. Shulman pointed out that in their attempt to incorporate generic educational research, many Teacher Education Programs suffered from the "missing paradigm" problem. They neglected the nature

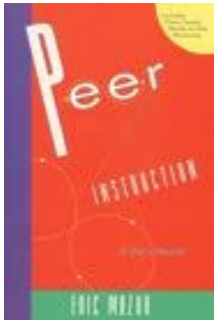
content-specific professional development, teacher education programs should emphasize the development of teacher-candidates' PCK.

Lastly, there is a significant gap between the findings of Physics Education Research (PER) [4] and current physics teaching practices. In the words of [illegible] Laureate, Prof. Carl Wieman

[*Physics in Canada*, **70**(2), 99-101]

5 Workshop Goals

To introduce you to:

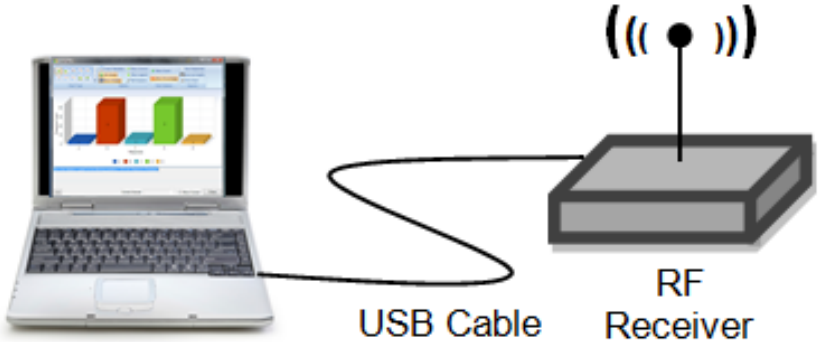


1. Peer Instruction & Peer Wise
2. PhET Computer Simulations

3. Data collection and analysis tools
4. Collaborative Learning Annotation System

5. Video Production of STEM demos

1 Peer Instruction



Software installed on the teacher's computer connected to a classroom projector

Clickers used by the students

In near future smart phones, i-pads and other devices will replace clickers, **but the basic pedagogy will remain the same**…

Peer Instruction

A clicker question is posed

Students work individually for about a minute to figure out the answer that they submit using clickers

Students' responses are displayed to the class without revealing the correct answer

Many of the students answered incorrectly.

Most of the students provided a correct response. Correct answer revealed.

Students work in groups of 2-3 to discuss the question.

Students resubmit individual answers using clickers.

An instructor leads a summary discussion with the class: the reasons for correct answer as well as the reasons for choosing the incorrect answers are elicited from the students.

1 Peer Instruction Pedagogy

LUMAT 1(5), 2013

Modeling Active Engagement Pedagogy through Classroom Response Systems in a Physics Teacher Education Course

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Heather Fisher
Department of Curriculum and Pedagogy, Faculty of Education, The University of British Columbia

Alexandra MacDonald
Department of Curriculum and Pedagogy, Faculty of Education, The University of British Columbia

Abstract One of the most commonly explored technologies in Science, Tech... and Mathematics (STEM) education is Classroom Respo... instructors generate in-class discussion by solici...

[LUMAT: Research and Practice in Math, Science & Technology Education, 2013. **1**(5): p. 525-544.]

1 Clickers & Active Learning

[2004, The Physics Teacher, 42(8), 47-48]

Tips for Using a Peer Response System in a Large Introductory Physics Class

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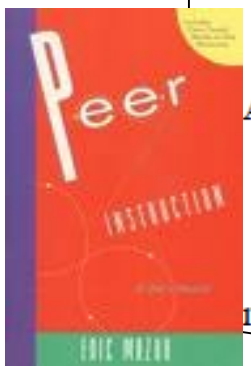
Clickers beyond the First Year Science Classroom

Marina Milner-Bolotin

Tetyana Antimirova

Anna Petrov

[2010, Journal of College Science Teaching, 40(2), 18-22]



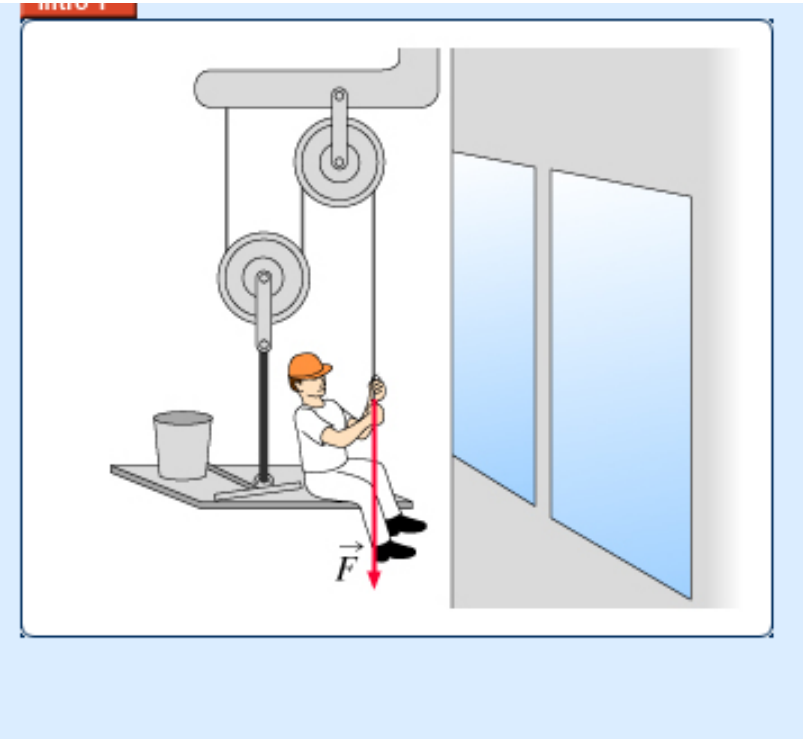
Abstract:

This case study's primary objective is to describe the implementation of the electron

response-system (clickers) in a small (N=25) second

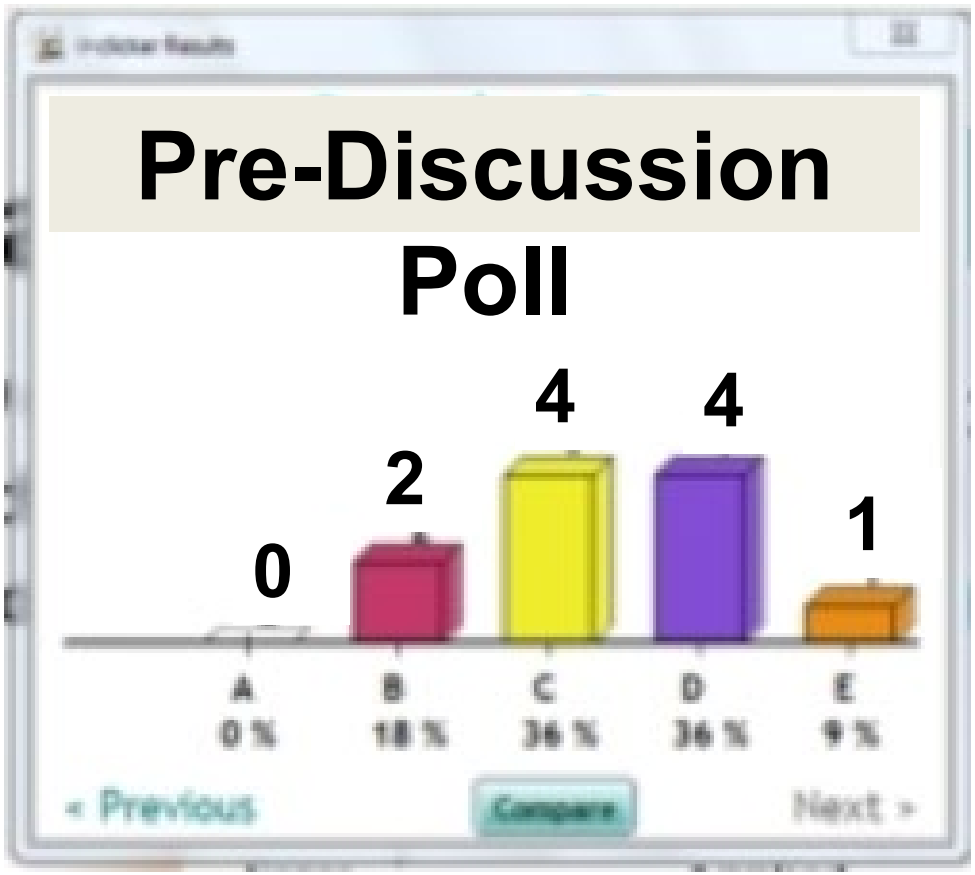
1 Peer Instruction Example 1

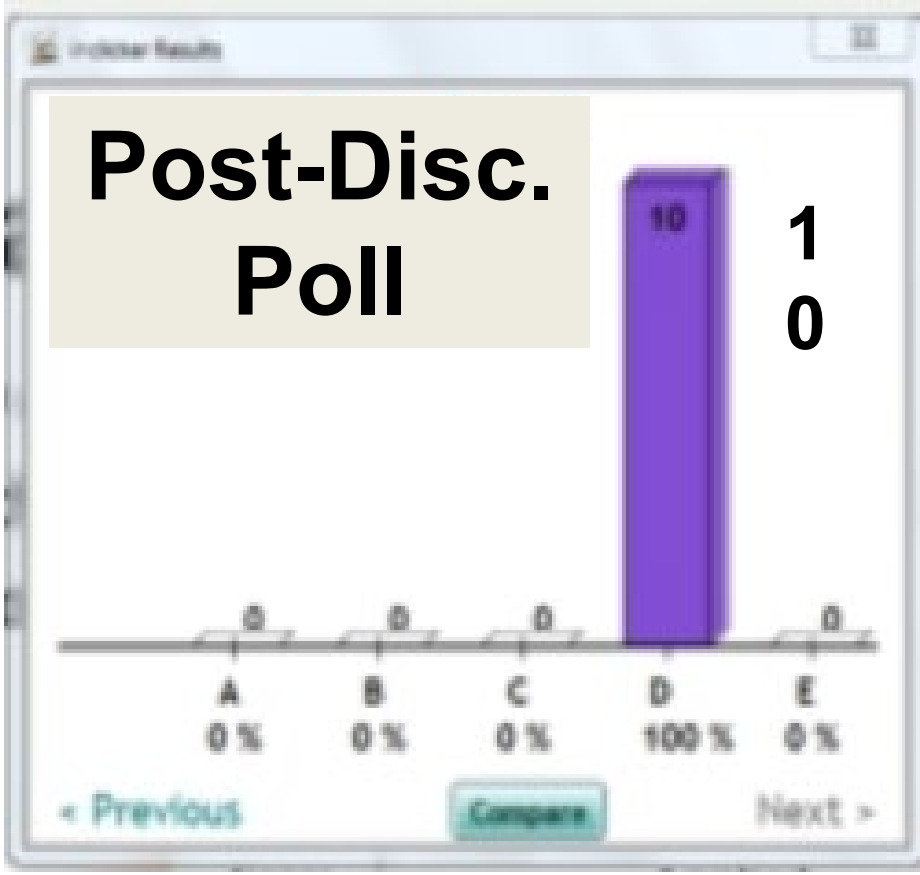
Find the magnitude of the force a 60 kg person has to pull the rope with in order to pull himself upwards with a **constant speed.**



A. 600 N
B. 450 N
C. 300 N
D. 200 N
E. 150 N

1 Peer Instruction in Action

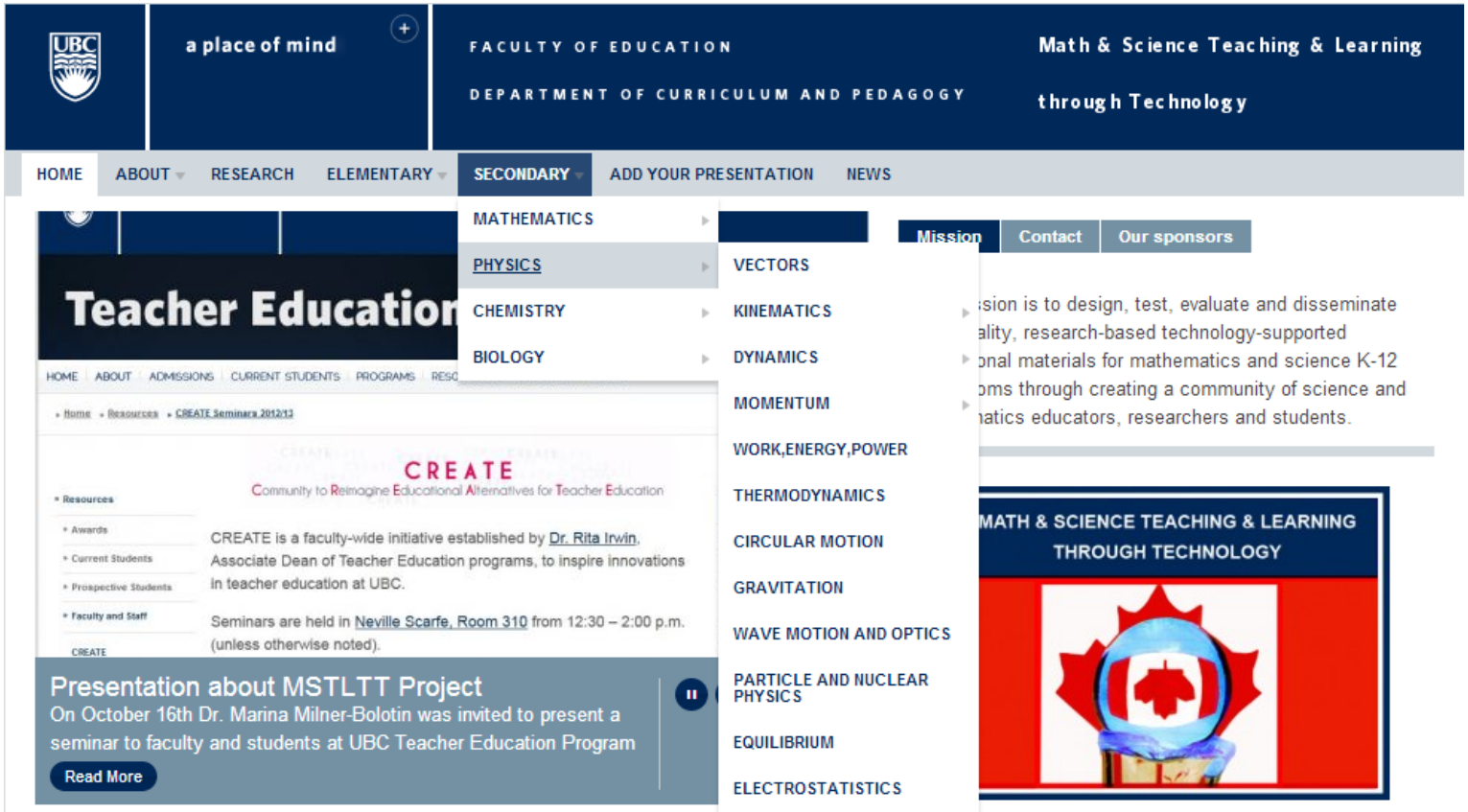




Respondents: Physics Teacher-Candidates

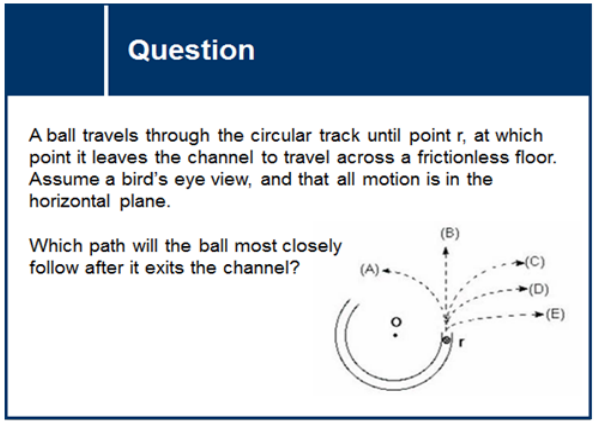
1

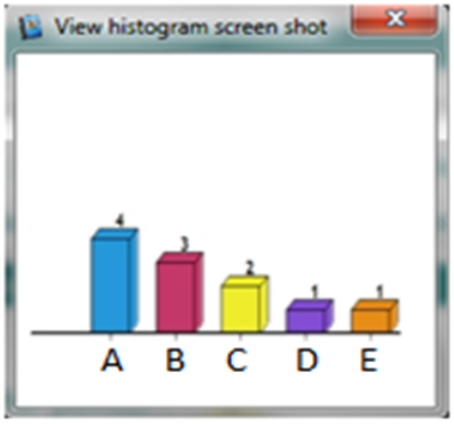
Math & Science Teaching & Learning through Technology



http://scienceres-edcp-educ.sites.olt.ubc.ca/

1 Technology-Enhanced Science Education





Peer Instruction and PeerWise integration

1 PeerWise Online System

EDCP357_2018

Home | Main menu

Your questions

view »

You are currently contributing **1** question
You have deleted **0** of your questions

Answered questions

view »

You have answered **240** questions (of these, **2** have been deleted
You have written **154** comments about these questions

Unanswered questions

view »

There are currently **0** unanswered questions you may answer
You are following **9** question authors

What is PeerWise?

Students use PeerWise to create and to explain their understanding of course related assessment questions, and to answer and discuss questions created by their peers.

http://peerwise.cs.auckland.ac.nz/

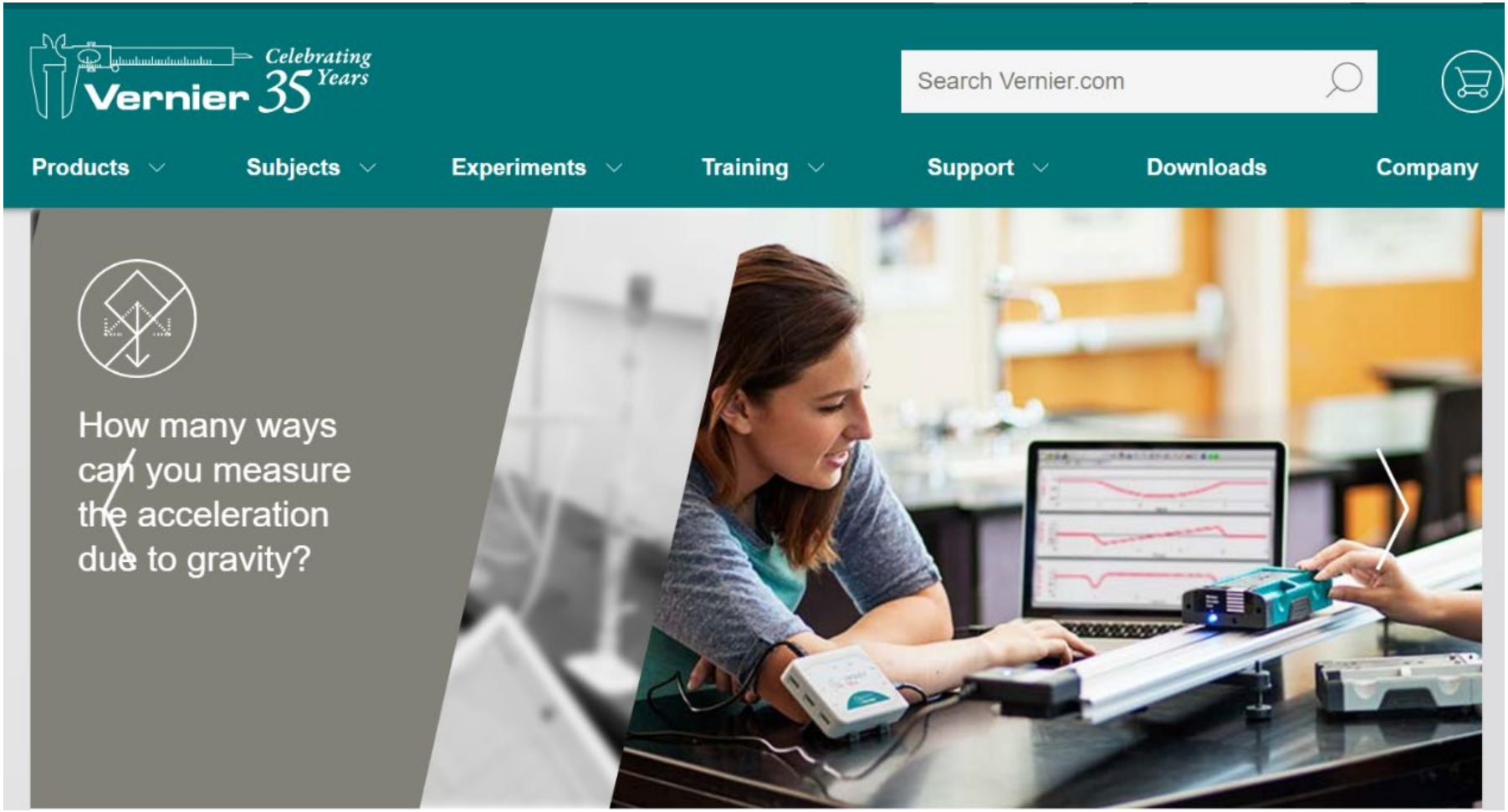
2 What is PhET?

FREE resources

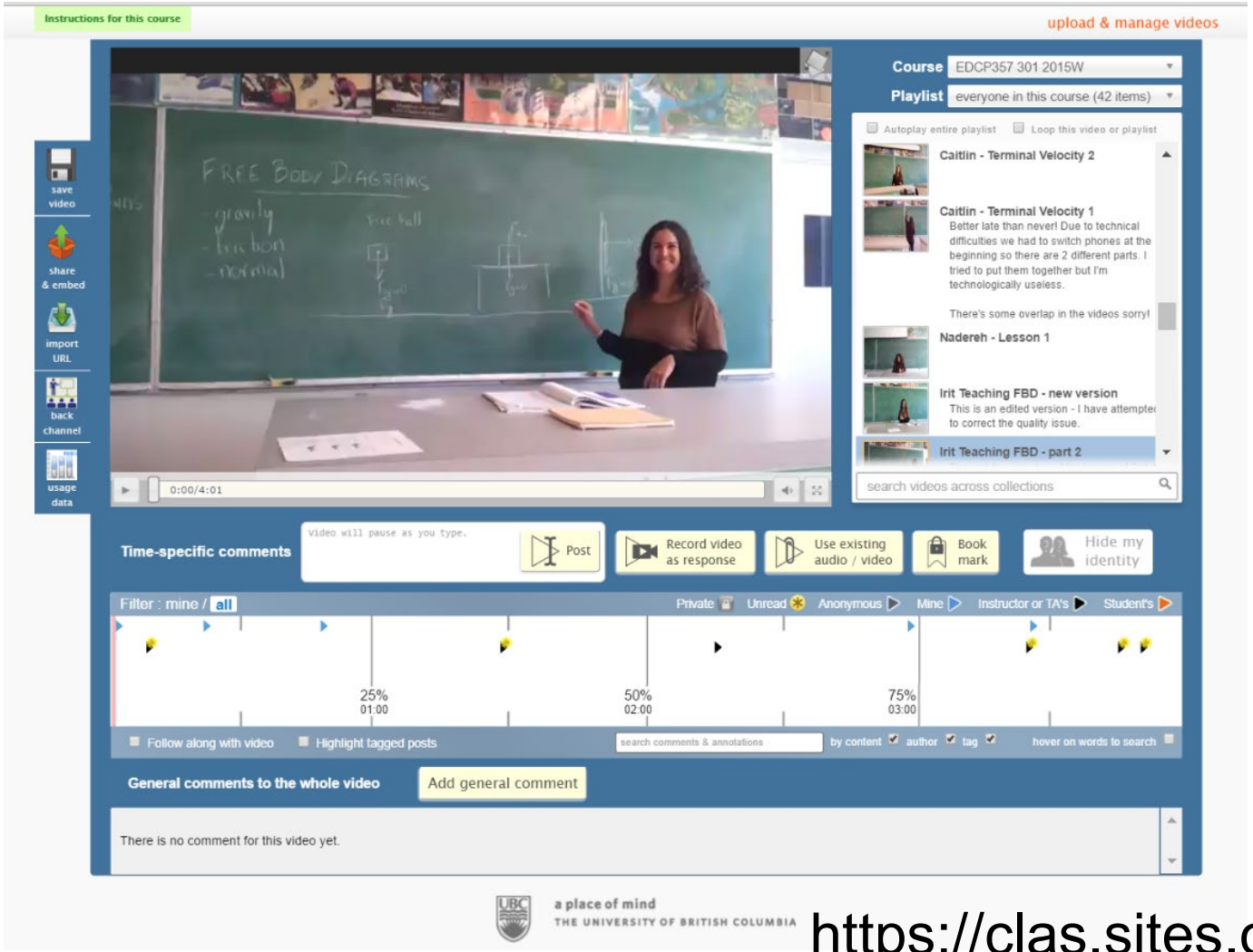
PhET Computer simulations from the University of Colorado, Boulder

You can download the simulations. They have translations.

3 Sensors in Physics Teaching



4 Collaborative Learning Annotation System - CLAS



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THE UNIVERSITY OF BRITISH COLUMBIA

https://clas.sites.olt.ubc.ca/sign-in/

4 CLAS

AAPT PHYSICS EDUCATION The Physics Teacher

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Home > The Physics Teacher > Volume 56, Issue 5 > 10.1119/1.5033879

PREV NEXT

Published Online: 18 April 2018

Promoting Reflective Physics Teaching Through the Use of Collaborative Learning Annotation System

The Physics Teacher **56**, 313 (2018); https://doi.org/10.1119/1.5033879

Marina Milner-Bolotin

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COLLECTIONS
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AIPTHESAURUSV1.2
- Educational aids
- Educational testing
- Classical mechanics
- Equipment and apparatus
- Physics teachers

ABSTRACT

Effective physics teaching requires extensive knowledge of physics, relevant pedagogies, and modern educational technologies that can support student learning. Acquiring this knowledge is a challenging task, considering how fast modern techno
expectations of student learning outcomes and of tea
21st-century physics teachers should be
about technology-enhe

[*The Physics Teacher, 56*(May), 313-316]

5 STEM Demonstrations

FACULTY OF EDUCATION FAMILY MATH & SCIENCE DAY

Photo by Paul Joseph, UBC Brand & Marketing

5 Video Production

Science & Math Education Videos for All

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Euler spins on a mirror

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Skaters can spin on a flat area of ice. Can they also spin on a flat area of a mirror? Or a bit trickier surface like a curve mirror i.e. concave mirror? Well, they can probably do it but definitely, only a mathematician and physicist like Euler can do it beautifully. Actually, not Euler, himself, but his disk's.

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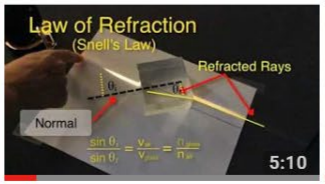

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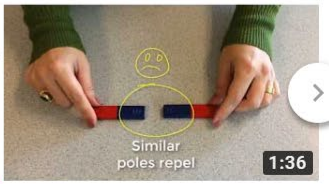

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Generously supported by UBC TLEF 2012-2018: $210,000

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How satisfied are you with the day?

1 3 5